Component Adhesions

Many circuit board manufacturers are now using double-sided printed circuit boards (PCBs) that must be reflowed twice. Consequently, component adhesion is a critical is sue to ensure all components remain in the proper location during reflow. To determine if a component will remain adhered to the bottom side of a PCB during the top side (or second) reflow process, the following formula calculation can be utilized:

Weight of the part per lead must not exceed the surface tension of the solder (per lead perimeter area).

$$M < (p \times \sigma \times 1\text{x}10^{-3}) \times n$$

Where:
M = part mass (grams)
p = lead perimeter (cm)
σ = surface tension of solder (dynes/cm)
n = number of leads

Conversion of dynes to grams (1x10E^{-3} grams/dynes)

Alloy	Surface Tension of Solder
62Sn/36Pb/2Ag	516 dynes/cm (0.516 N/m) @ 245°C
63Sn/37Pb	510 dynes/cm (0.510 N/m) @ 245°C
SAC305	567 dynes/cm (0.567 N/m) @ 260°C
SAC387	560 dynes/cm (0.560 N/m) @ 260°C

Example

32 lead SMT dual inline package (DIP)
Component mass = 2.5g
Lead dimensions: 0.061cm x 0.152cm

Component mass < (perimeter of the lead in cm) x (surface tension of the solder in dynes/cm) x (gram/dyne conversion factor) x (number of leads)

$$M < (p \times s \times 1\text{x}10^{-3}) \times n$$

p = (2 x 0.061cm) + (2 x 0.152cm) = 0.426cm per lead
n = 32
σ = 510 dynes/cm for Sn63

Component mass (M) < (p x 510 dynes/cm x 0.001 g/dyne) x 32

(0.426cm x 510 dynes/cm x 0.001 g/dyne) x 32 = 6.95g

M < 6.95g

The mass of the DIP component is 2.5g and the calculations verify that the surface tension of the solder should hold it in place.

APPLICATION NOTE

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