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 issue 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:

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

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

Conversion of dynes to grams (1x10^{-3} grams/dyne)

<table>
<thead>
<tr>
<th>Alloy</th>
<th>Surface Tension of Solder</th>
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<tbody>
<tr>
<td>62Sn/36Pb/2Ag</td>
<td>516 dynes/cm (0.516 N/m) @ 245°C</td>
</tr>
<tr>
<td>63Sn/37Pb</td>
<td>510 dynes/cm (0.510 N/m) @ 245°C</td>
</tr>
<tr>
<td>SAC305</td>
<td>567 dynes/cm (0.567 N/m) @ 260°C</td>
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<tr>
<td>SAC387</td>
<td>560 dynes/cm (0.560 N/m) @ 260°C</td>
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**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)

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

\[ p = (2 x 0.061cm) + (2 x 0.152cm) = 0.426cm \text{ per lead} \]
\[ \sigma = 510 \text{ dynes/cm for Sn63} \]
\[ n = 32 \]
\[ M < (0.426cm x 510 \text{ dynes/cm}) x 0.001 \text{ g/dyne} x 32 \]
\[ M < 6.95g \]

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.

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