No-Flow Underfill Process Guidelines

APPLICATION NOTE

Dispensing: Calculating Required Underfill Volume

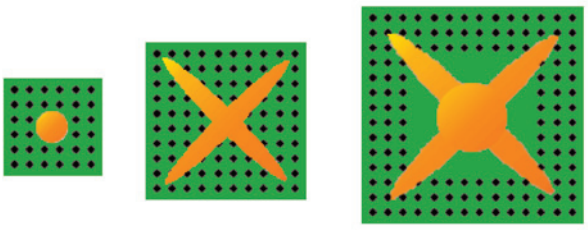
The weight of the component and the amount of collapse of the ball during reflow affects the exact amount of underfill required for a particular part. For an estimated starting point, the following equation can be used to calculate the mass of underfill required to be dispensed:

$$\text{underfill mass} = \left((x^*y^*h) - \frac{n}{2}\left(Ah + \frac{\pi h^3}{3}\right)\right)\rho$$

x: width of component
y: length of components
h: bump height
A: pad area
n: i/o count
ρ: density (NF-220 or NF-260 = 1.18/cm^3)

Dispensing: Sample Dispense Patterns

There are a number of different patterns that could be used for dispensing no-flow underfill. It is important to note that it is not necessary to cover all of the pads with underfill while dispensing. The underfill will spread across the remainder of the pads during placement and reflow. To minimize the potential for entrapping air, the following are some recommended dispense patterns:



Component Placement:

Placement of the BGA/CSP into no-flow underfill can be conducted using conventional pick and place equipment. However, unlike placing a component into solder paste, a no-flow underfill relies on the placement force to displace the material across the entire under side of the component. To achieve this successfully, placement forces up to 20psi and hold times (time the pick and place holds the part in the down position) of up to 2 seconds may be required. The exact times and pressure will be dependent on component size, I/O, dispense pattern, and quantity of underfill dispensed.

Reflow:

No-flow underfills are designed to reflow and cure through a standard solder paste reflow profile. While this can be done, some precautions should be taken to ensure high yields. Reflow profiles with long soaks are not typically recommended. This type of profile can lead to partial curing of the underfill prior to the solder going liquidus. The result will be open solder joints. In addition ramp rates greater than 1.5°C/second can lead to skewing of the part due to a rapid drop in the underfill viscosity.

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