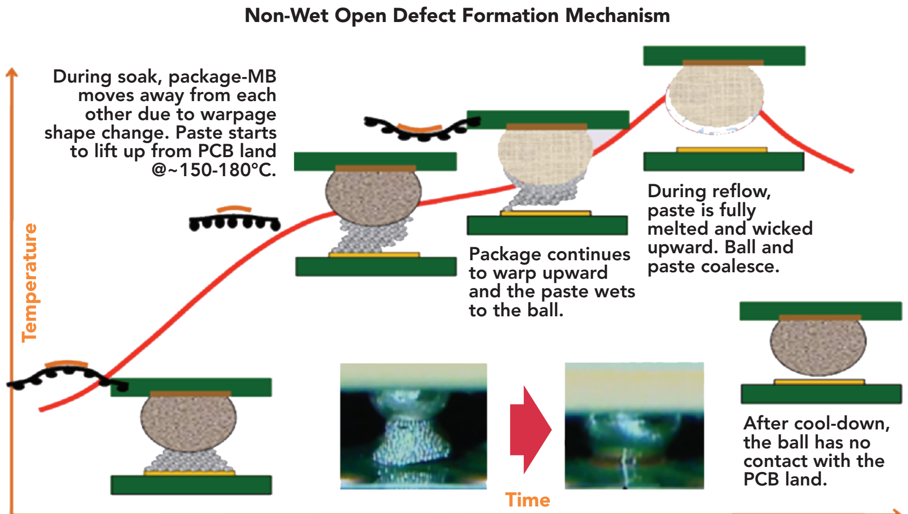
Non-Wet Opens

Definition: The Non-Wet Open defect occurs when the solder sphere (and solder paste) on the BGA have no physical contact with the pad after reflow, yet there was paste on the pad prior to the board entering the oven. The defect is identified by the presence of the non-wetted pad after reflow.

This can occur with some new ultra-thin chip designs that can have a very high warping signature characteristic. During reflow, the solder paste can have a higher propensity to adhere to the solder sphere vs. the pad, especially on OSP coated boards. This happens, when the component warps, and the distance from the component to the pad becomes so great that the solder paste is physically lifted off the pad and then reflows onto the ball during the time above liquidus, thus not leaving any solder paste on the pad.

Non-Wet Open Defect Formation Mechanism



Solder paste preferentially wets to the solder ball rather than the PCB land
Mechanism primarily driven by paste characteristics

Possible Causes:

Description	Recommendations
Stencil Insufficient volume of solder at the point of the non-wet open where there is not enough flux left to overcome the OSP once the part comes back from warping.	• Increase the volume of paste by opening up the stencil apertures to provide more paste volume on the pad. Increase the aperture-to-pad ratio to 1:1 or 1:1.1.
Solder Paste Many popular commercially available solder pastes have a greater propensity to adhere to the sphere vs. the OSP pad during reflow. Along with the high warping signature of these components, this creates a condition in which the paste is no longer in contact with the pad and thus reflows to the ball.	• Switch to a solder paste that has the proper wetting force and time balance characteristics to overcome the paste lifting, but still has enough activity to overcome the OSP on the pad when the part comes out of the warping stage and flattens out. There are a number of solder paste formulations that have been designed and/or have been tested against this defect.

Picture from Intel
Intel Paper presented at SMTAI
"Fundamentals of the Non-Wet Open BGA
Solder Joint Defect Formation," Dudi Amir