Bonded and Bumped Wafers

Application Overview:

Acoustic inspection of bonded and bumped wafers has been given a lot of interest recently as advances in wafer manufacturing has generated a significant need to ensure wafer reliability. SAM's ability to detect extremely (<0.1 micron) thin air gaps makes it a superior imaging tool for Silicon-on-Insulator, coated wafers or a variety of other high-end wafer applications. The SAM results allow for exact defect location to be noted so the known good areas on the wafer can be salvaged, reducing scrap and improving reliability. Many of the types of defects detected by SAM cannot be found upon initial electrical tests, but will cause long-term device reliability to be compromised.

Package Types:

SOI, Silicon Nitride, Silicon Carbide, coated wafers, Bare silicon or GaAs wafers

Inspection Standards:

- none -

Failure Types Commonly Detected:

Non-bonded wafers
Micro-cracks
Bump integrity
Contamination (excess flux)

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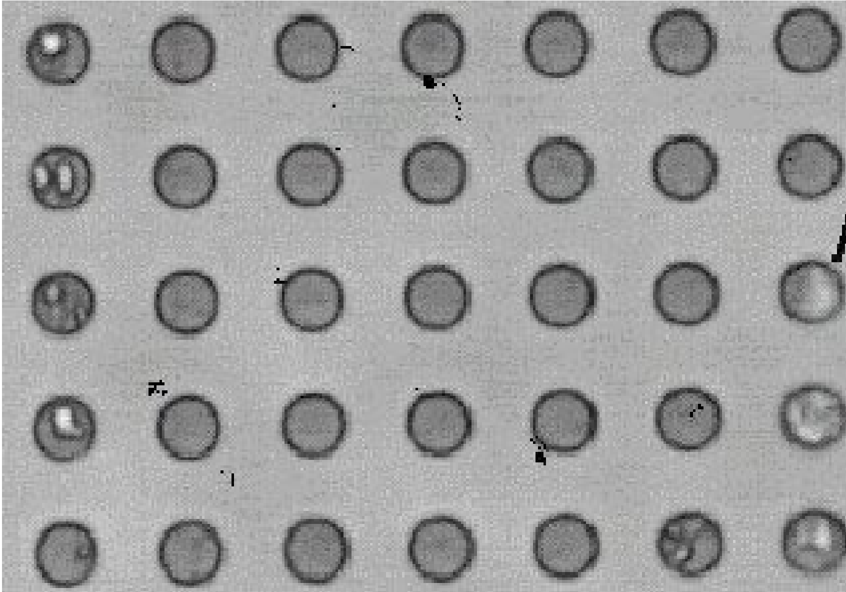
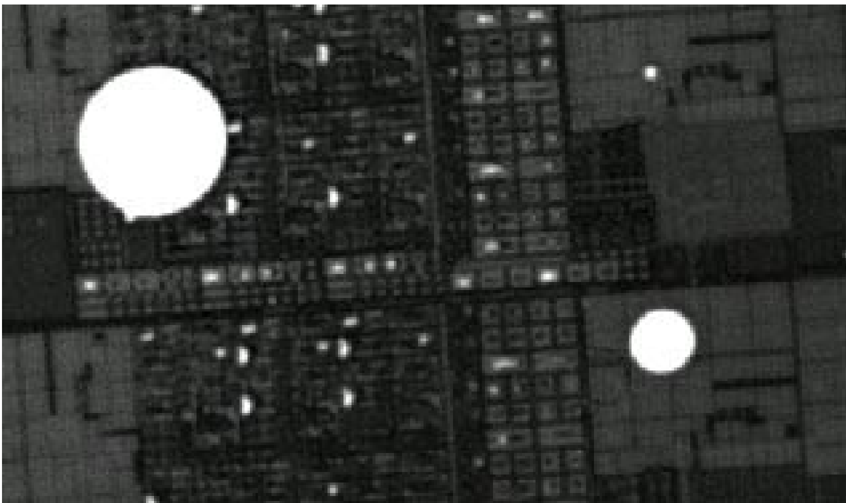
Images:



This is a pulse-echo (reflected) mode image of a bumped silicon wafer. In this case, ultrasound was sent through a silicon wafer to the bumped to wafer interface. Bright white areas note the location of voids within the solder material. Large enough voids can negatively impact structural bump integrity. Some of the defects indicate a partially disbonded bump. In the case of this bump, the solder did not properly wet with the under-bump metallurgy on the wafer surface. This non-wetting causes a thin, planar air gap to form between the bump and wafer. The structural integrity and electrical performance of this bump is impacted.



This is a pulse-echo (reflected) mode image of a test Silicon-on-Insultar (SOI) wafer. A 10,000 x 10,000 pixel resolution scan was used to generate this image. In this case, ultrasound was sent through a silicon wafer to the silicon dioxide insulating interface. Large circular bright white areas are representative of air voids trapped in the silicon dioxide layer. Smaller bright white areas represent excessive flux residue that has left an air pocket after baking.

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