

Asymtek Applications Hotsheet

Jetting Underfill Between Two Dissimilar Die (Ablestik UF8828)

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In this application, two die of dissimilar gap, height, and shape were placed at a distance of 0.35 mm and 0.45 mm to help define design rules for package design.

Settings Summary

Platform	Millennium [®] M-2020
Jet/Pump/Valve	DispenseJet [®] DJ-9000 with static seal
Fluid Type	Underfill
Fluid Manufacturer & Product number	Ablestik UF8828
Fluid Details	9,600 cps, 48-hour pot life, Thixotropic index 5.6
Hardware Configuration	0.075 mm nozzle (P/N 210753-3) 0.100 mm nozzle (P/N 210753-4) 0.75 mm "C" seat (P/N 210734-6) 2.4 mm needle (P/N 7200580-16)
Fluid Pressure	69 kPa (10 psi)
Nozzle Temperature	70 °C (for 0.075 mm nozzle) 65 °C (for 0.1 mm nozzle)
Dispense Height	0.450 mm
Valve on / off	3/3
Micrometer Setting	15 increments
Substrate Temp	110 °C
Substrate	PCB package
Applications Development	Developed by Serge Lemos and Alan Lewis

Results Summary

Several factors limited the ability to dispense in the 0.35 mm gap with consistency: surrounding components at 0.45 mm above the surface, minimum fillet height of 50% on the side of the die, and dissimilarity of the die. However, jetting in the 0.45-mm gap proved to be feasible.

The material was dispensed in the middle of the gap between the die, 0.4 mm from the bottom of the die as shown in the picture below. The 0.4 mm offset of the dispense pattern was used to prevent excessive bleed out of the underfill.

Dispensing pattern for the 0.350-mm spacing was: 6 passes of 0.4 mg with wait-time between passes of 3/6/6/6/6 seconds. Dispensing pattern for the 0.450-mm spacing was: 4 passes of 0.6 mg with wait-time between passes of 3/6/6 seconds.

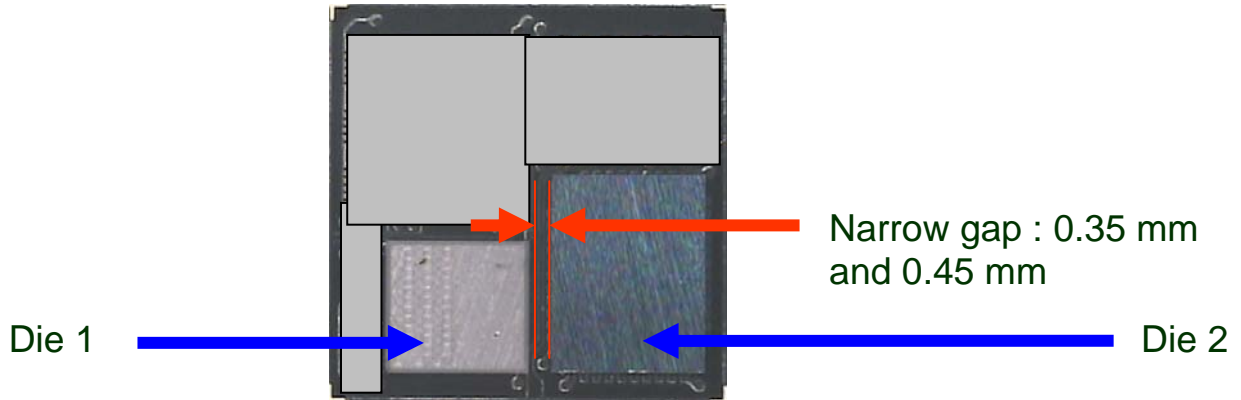
Dot weight from the 0.075 mm nozzle varied from 0.012 to 0.013 mg. Dot weight from the 0.100 mm nozzle was approximately 0.016 mg.

It was found that the limiting factor was the amount of material dispensed in each pass and the amount of time spent waiting between passes. Since the 0.075 mm nozzle required higher temperature, the 0.100 mm nozzle was used for most of the testing.

The wait-time was not fully optimized, however, it was found to be very important to let the material flow before the next pass or it would splash and/or be forced to flow over the top of die 2.

A total of 93 packages with the 0.35 mm spacing and 232 packages with the 0.45 mm spacing were dispensed with good quality. Preliminary analysis with a 100 MHz Sonoscan C-SAM[®] inspection system showed no voids prior to cure. Slight contamination on the top of die 2 was observed for 0.35 mm spacing. With the amount of material that was dispensed to achieve good fillet height, it was determined that minor top-side contamination was unavoidable for the 0.35 mm spacing.

Figure. Two dissimilar die placed apart at two different gaps



Die 1 characteristics: 3 x 3 x 0.3 mm, with gap of 60 μm , and bump pitch of 200 μm .

Die 2 characteristics: 3.2 x 4.3 x 0.2 mm, with gap 40 μm , and bump pitch of 130 μm .