



Illuminator Selection for Camalot Machine

Flipchip Underfill on Flex-circuit requires die edge detection algorithm to determine the edges of the Flipchip die. Once the edges are established, the machine will then dispense along the specific location of the edge of the die as per specified in the program.

Camalot offers three types of illumination - RED, WHITE and BLUE. All three types are capable of providing shades in detecting a die for Flipchip Underfill process. With proper brightness and contrast adjustment they will provide different shades for die surface as foreground and substrates/PCB background or vice versa. Among the three illuminator the blue light illumination is the only one that could eliminate the metal traces from the substrate, thus giving more accuracy in detecting the die edges.

Analysis and Discussion:

- 1) Red, Blue and White Illumination can perfectly detect a die with a good brightness and contrast

settings. A good setting means that the reflection of the die is white/light and the background is black/dark. Red and White light reflects the metal traces of the strip and the blue light reflects only the die, thus, providing more accuracy in detecting the die edges.

- 2) Die edge detection would fail if the die reflection seen by the vision system are almost the same color as the background. In the evaluation, all the units with black reflection of the die surface/ foreground encountered

intermittent die detection failure and sometimes, the machine would accept a unit but will dispense inside or outside the die area. This kind of error will result to needle crashing to the die or dispense away from it.

- 3) The 10 sample that was used had different contrast to different color of lighting. All die with dark die reflection is vulnerable to die edge detection failure which ever color of illumination is used. But among the three colors, Blue is recommended since the

DIE SURFACE REFLECTION MATRIX:

UNIT	RED	BLUE	WHITE
1	white	white	gray
2	white	white	white
3	black	white	gray
4	white	gray	gray
5	white	white	white
6	black	white	gray
7	black	white	gray
8	white	black	black
9	white	black	black
10	gray	black	black

CAMERA SETTING:

	5.6	8	1.7
Brightness	5.6	8	1.7
Magnification	0.32	0.32	0.32

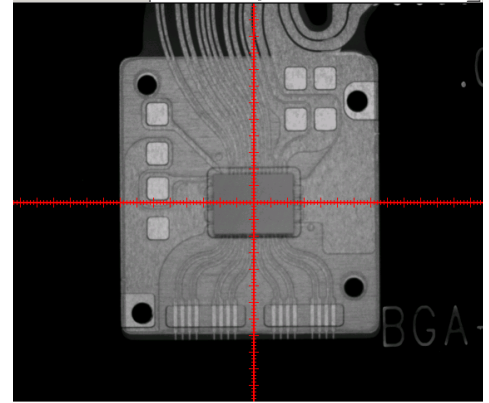
DIE DETECTION OFF-SET TOLERANCE:

	0.190 mm	0.210 mm	0.180 mm
ACCEPT UP TO	0.190 mm	0.210 mm	0.180 mm
FAILURE @	0.200 mm	0.220 mm	0.190 mm

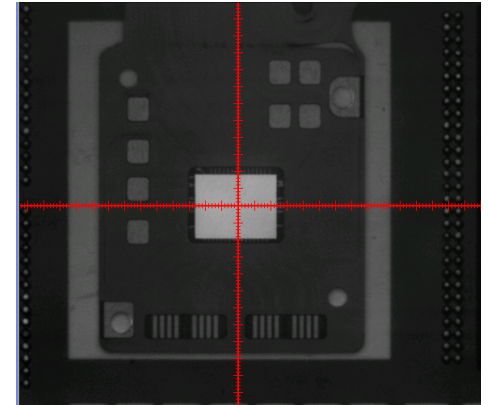
Metal Traces is not reflected by the light and would give the vision system a clearer recognition of the edges.

- 4) The magnification of the camera is constant every time the illuminator is changed and only the setting of brightness was adjusted.
- 5) Using the one unit to test the offset tolerance of a unit, Blue light is preferred among the

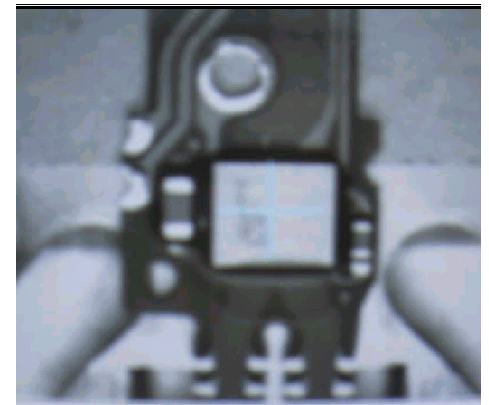
three illumination colours since it can detect the edges up to 210 microns offset, while the Red and White light detects only up to 190 microns and 180 microns respectively. ■



Red Illuminator



Blue Illuminator



White Illuminator



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