

# Improving Marking Visual Inspection through Spectrum Enhancement Using Oblique Lightning Technique

Alvin S. Soreda, Ernesto T. Antilano Jr.

New Product Development and Introduction, Back-End Manufacturing & Technology,  
STMicroelectronics, Inc., 9 Mountain Drive, LISP II, Calamba 4027 Laguna, Philippines

**Keywords**— *Oblique, Marking, Legibility, Spectrum Frequency, Laser.*

## I. OVERVIEW

- In a semiconductor manufacturing industry, finished product such as micro devices packages are required to have own traceability to track its unique identity.
- Now a day, one of the most useful product identifier on semiconductor manufacturing is through laser marking and its readability.
- Laser marking is a process of etching technique by using amplified light beaming emitted from a machine module penetrated through the mold surface of the device package to create permanent traceability.
- It also offers many advantages and each user will find specific benefits as they integrate it into their production processes.

## II. PROBLEM IDENTIFICATION

- Marking legibility is very vital in semiconductor manufacturing which carries the identity of each device that includes logo's, part numbers, symbol, date codes and product history. Each part may have a unique identification.
- One common issue encountered on product marking during Visual Mechanical Inspection (VMI) is the legibility of marking characters when VMI performs on low magnification microscope.
- Legibility failure during VMI has a big impact on a high volume manufacturing process operation because of a non-value adding activities which will impact production UPH although it is only cosmetic defect, product functionality and reliability is not on risk
- Figure 1.0 shows the marking legibility failure of a finished device product. The marking identity of the sample device are unable to read when using common used low magnification microscope with ring light spectrum.
- Inspector do a tray tilting with 30 to 45 degrees' inclination angle in order to see the marking characters. This is a non-value adding activity wherein additional time should be consumed doing this practice.

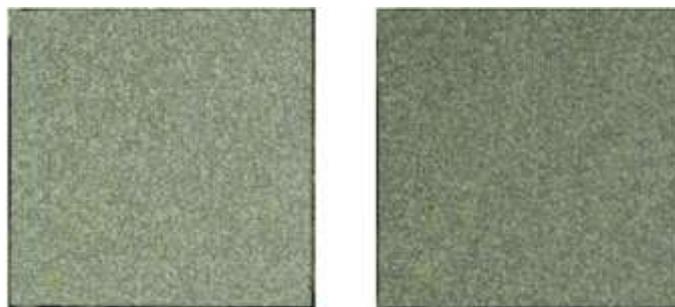


Fig. 1.0 Ineligible marking when view at low magnification microscope with ring light spectrum

## III. DESIGN SOLUTION

- In a common low magnification microscope light setting, Ring light spectrum is already used but with limitation depending on the surface color of material that will be inspected.
- Emitted ray of lights from ring light as source which is commonly in vertical position absorbed by dark colors surface wherein a small amount of ray lights back on the scope which results to cancellation of images seen by the observer as Figure 2.0 illustrated.

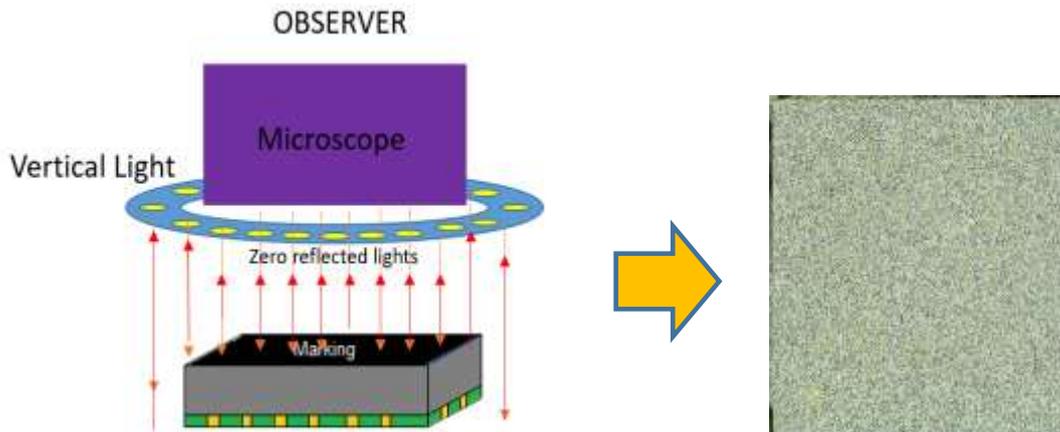


Fig. 2.0 Vertical Ring light setting with corresponding result

- To enhanced the images needs to be seen by observer, Lightning spectrum technique should be applied. As above figure 2.0 the images are being lessen due to dark appearance of the field area wherein the lights emitted by ring light are being absorb and some of the lights carrying the images are undergoing on cancellation process due to vertical position of light source. In this scenario, the observer unable to see the marking details due to lack of reflected lights are bounce back on the microscope.
- In order to have much lightning to bounce back to observer microscope, Oblique lightning spectrum should be applied. On Figure 3.0 the setting of light source is in oblique position at 30 to 45 degrees' angle. The light rays carrying the images are bounce back to microscope observer to have better and eligible view of reflected images.

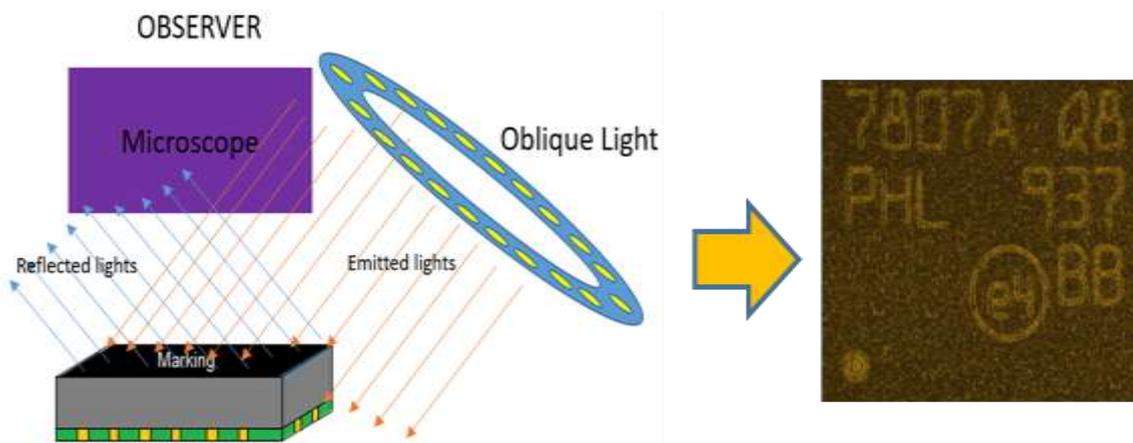


Fig. 3.0 Oblique Ring Light setting with corresponding result

- After a series of test, Implementation of this oblique light setting on Inspection process is required. It will provide comfort and eliminate non-value adding activity during VMI. Production output per hour capacity are being maximized to achieve a fast delivery time.