International Research Journal of Advanced Engineering and Science
ISSN (Online): 2455-9024

Enhanced Tape and Reel Spacer to Eliminate Depressed Wire for Micromodule Packages

Edwin M. Graycochea Jr., Bryan Christian S. Bacquian, Antonio R. Sumagpang Jr.
New Product Development & Introduction, Back-End Manufacturing & Technology, STMicroelectronics, Inc.
Calamba City, Laguna, Philippines 4027

Keywords— *Tape and Reel,Spacer, Depressed wire,UPH (unit per hour) wirebond.*

I. OVERVIEW

Micro module packages are normally with tape and reel process in semiconductor manufacturing industry. This thin package comes with a tape carrier wherein silicon die was attached and a yellow spacer is placed to support the tape in winding the whole sub lot. During the qualification stage of this package, one major issue encounter is depressed wire at the output reel. Figure 1 shows the assembly process flow of the package and wire bond is the critical process wherein the problem occurred was highlighted in red box.

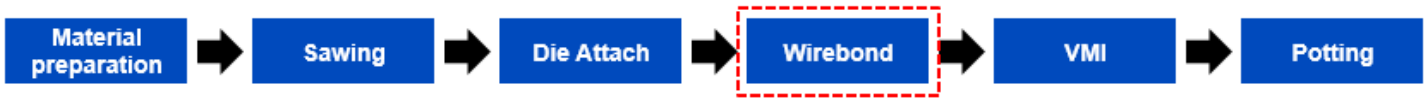

Fig. 1. Assembly process flow.

II. PROBLEM IDENTIFICATION

During the processing of the lot at wirebond process, one major top contributor is depressed wire at output reel. This problem was initiated and caused by a tape and reel wide spacer, as shown in Figure 2. Problem phenomena happens when the wide spacer stuck into the reel width therefore can obstruct the flow of the reel then after will be push up or down towards the spacer, thus resulting to broken wire. Afterward, process mapping is also conducted to validate that the broken wire can also appear after wirebond and after processes as well.

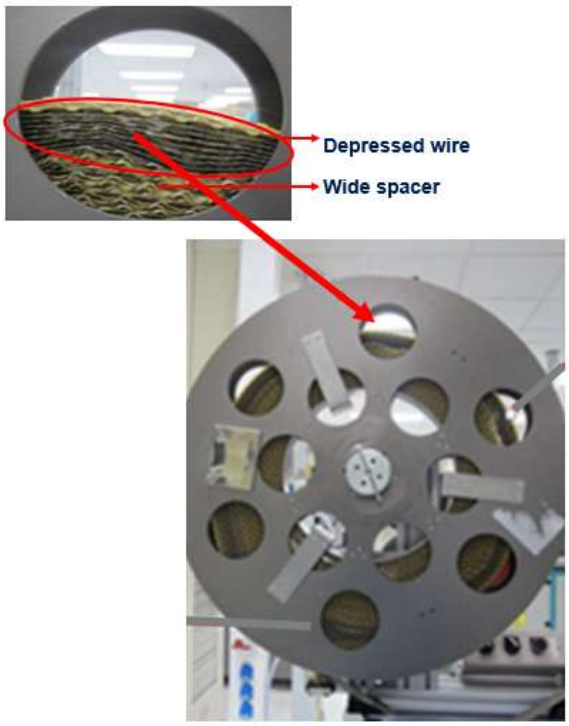

Fig. 2. Manifestation of depressed wire.

Edwin M. Graycochea Jr., Bryan Christian S. Bacquian, and Antonio R. Sumagpang Jr., "Enhanced Tape and Reel Spacer to Eliminate Depressed Wire for Micromodule Packages," *International Research Journal of Advanced Engineering and Science*, Volume 4, Issue 4, pp. 94-95, 2019.

International Research Journal of Advanced Engineering and Science
ISSN (Online): 2455-9024

During the reliability of the product, units were subjected with 50 time cycles wherein one failure occurred. Failure Analysis through Decapsulation and SEM photo, shows broken wire as shown in Fig. 3. was observed and was correlated as the cause by a wide spacer bowing.

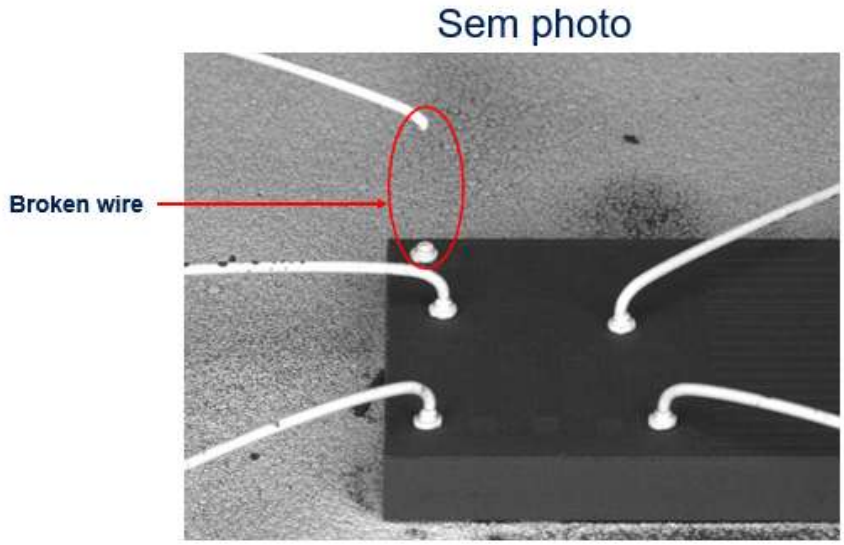

Fig. 3. SEM photo.

III. Semiconductor Package Design Solution

The improved semiconductor spacer design is shown in Fig. 4 with a thick spacer to have a strong support during the reeling of the tape. With the new improved spacer, design will eliminate the occurrence of depressed wire and this will help to increase the yield.

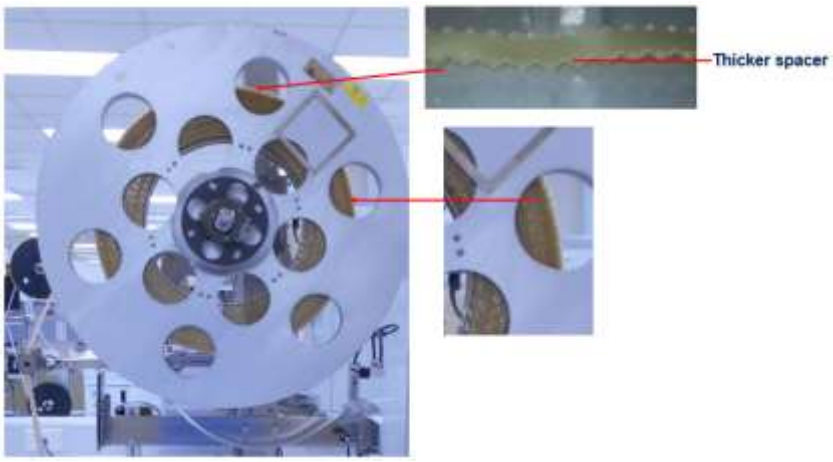

Fig. 4. New improved spacer design

This new improved spacer design can also help to increase the UPH (unit per hour) of the machine because the spacer is thick and strong which results to minimal error. Unlike with the old spacer, you can manually rotate the reel due to bowing of the spacer. This can also eliminate the occurrence of reliability failure to have a functional product.

Edwin M. Graycochea Jr., Bryan Christian S. Bacquian, and Antonio R. Sumagpang Jr., "Enhanced Tape and Reel Spacer to Eliminate Depressed Wire for Micromodule Packages," *International Research Journal of Advanced Engineering and Science*, Volume 4, Issue 4, pp. 94-95, 2019.