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

Improvement in Stencil Printing for Solder Paste Process of Semiconductor Device

Edwin M. Graycochea Jr., Frederick Ray I. Gomez, Bryan Christian S. Bacquian
Central Engineering and Development – NPI, Back-End Manufacturing & Technology, STMicroelectronics, Inc.
Calamba City, Laguna, Philippines 4027

Keywords— *Solder paste process; semiconductor; leadframe; stencil printing; off-centered ball.*

I. Overview

- Surface mount technology (SMT) includes a solder paste printing process wherein the solder paste material is applied below the semiconductor device using stencil printing
- Development of this type of technology applied in a semiconductor leadframe package offers great challenges, especially as the stencil printing is used for the solder ball creation
- A specialized semiconductor leadframe package shown in Fig. 1 with high-density input-output (I/O) connectivity requires the said stencil printing for solder paste process

Fig. 1. Bottom view of the specialized semiconductor leadframe device.

II. Problem Identification

- During the stencil printing process, one of the issues encountered is the off-centered ball as illustrated in Fig. 2

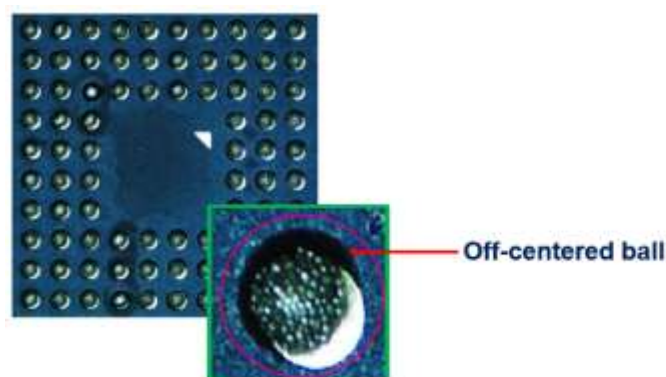

Fig. 2. Off-centered ball defect appearance.

- Aside from alignment issues due to warpage, one cause of the off-centered ball is the viscosity of the solder paste material
- The solder paste material in Fig. 2 also showed a colder or uncured characteristic
- Though machine parameter optimization was extensively employed, still off-centered balls occur

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

III. Package Design Solution and Process Improvement

- As previously mentioned, one factor that contributes to off-centered ball is the type of solder paste material
- Now with the improved design using a new solder paste material with thin viscosity, the solder ball formation greatly improved as highlighted in Fig. 3

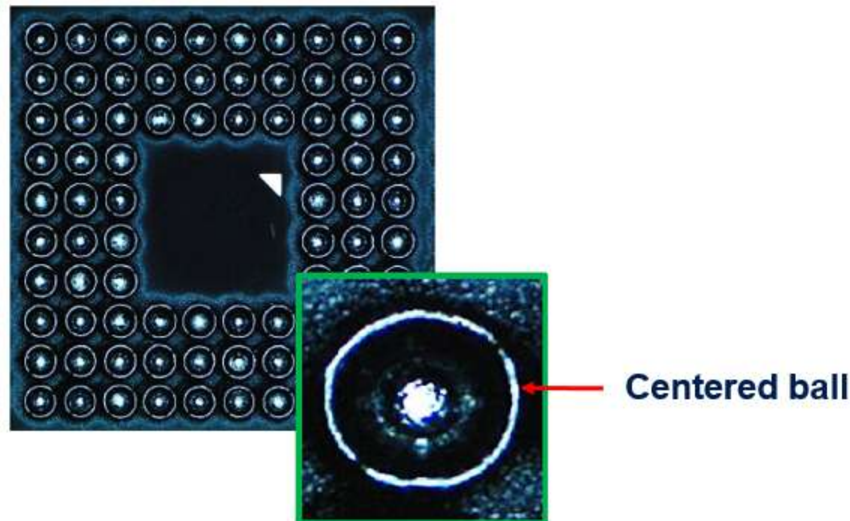

Fig. 3. Improved solder ball formation.

- The new solder paste material in Fig. 3 showed cured solder paste appearance, as compared to the material in Fig. 2 with colder solder joints characteristic
- Another advantage of the solution is that the new solder paste material has higher thermal and electrical response compared to the other one

Edwin M. Graycochea Jr., Frederick Ray I. Gomez, and Bryan Christian S. Bacquian, "Improvement in stencil printing for solder paste process of semiconductor device," *International Research Journal of Advanced Engineering and Science*, Volume 4, Issue 3, pp. 334-335, 2019.