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

Semiconductor Die Design with Pre-Applied Die Attach Material

Frederick Ray I. Gomez, Tito T. Mangaoang Jr., Nerie R. Gomez
Back-End Manufacturing & Technology, STMicroelectronics, Inc., Calamba City, Laguna, Philippines 4027

Keywords*— *Silicon die; pre-applied filler; laser groove; adhesion; die attach material.

I. Overview

- Front-of-line (FOL) processes namely the wafer pre-assembly and die attach processes have challenges especially in processing thin dice with thickness ranging from 50µm to 120µm
- Typical assembly manufacturing process flow in Fig. 1 shows the mentioned processes at FOL stations

Fig. 1. Assembly manufacturing process flow.

II. Problem Identification

- Potential die-related issues like die cracks, die delamination, and die attach voids in Fig. 2 occur especially on thin die applications during diebonding or die attach process

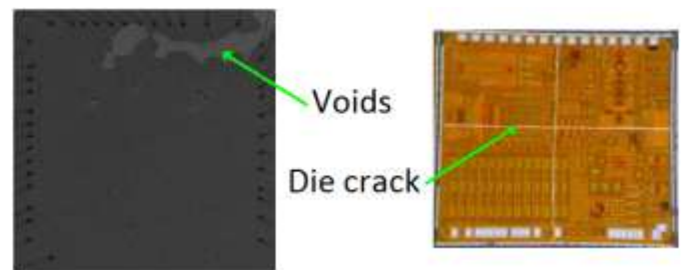

Fig. 2. Die-related anomalies.

- With the increasing demand on thin die applications, mitigation of die-related issues is one big challenge during wafer preparation or pre-assembly and the diebonding process

III. Semiconductor Die Design Solution

- Silicon die backside area is augmented with pre-applied die attach material or filler material on the die's grooved periphery
- With pre-applied filler material, the die attach coverage is enhanced and the die attach adhesion is more robust

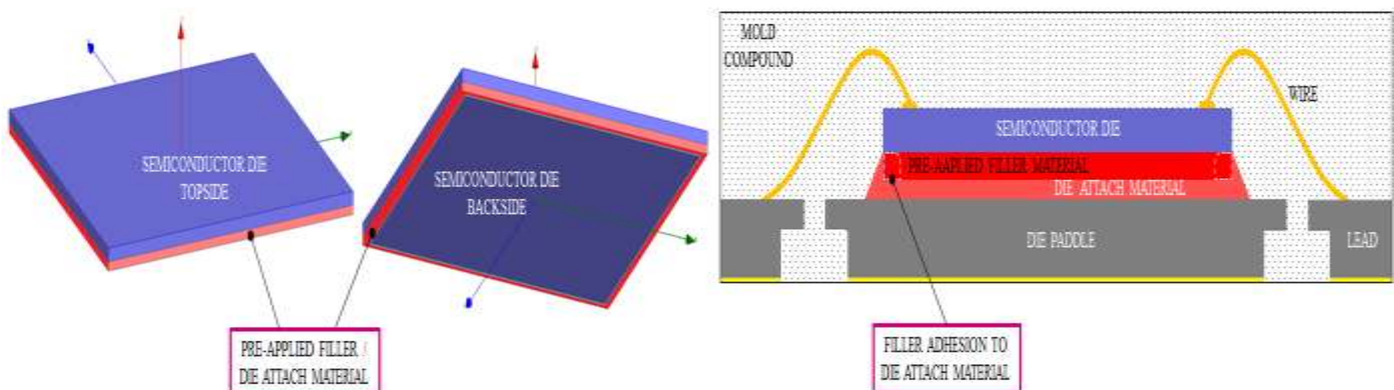

Fig. 3. Semiconductor die augmentation with pre-applied die attach material.

- Laser grooving technology is used for the formation of the peripheral groove
- The semiconductor die design with pre-applied die attach material could help mitigate die to die attach delamination
- Lower coefficient of thermal expansion (CTE) mismatch is created between the pre-applied filler or die attach material and the subsequent die attach material
- With the design, die cracks could be prevented and die attach voids could be minimized