

# A Semiconductor IC Packaging Solution for Device Miniaturization

Frederick Ray I. Gomez, Rennie S. Rodriguez

New Product Development & Introduction, Back-End Manufacturing & Technology, STMicroelectronics, Inc.  
Calamba City, Laguna, Philippines 4027

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## I. INTRODUCTION

Miniaturization and densification is the current roadmap of all semiconductor devices. Downsizing or decreasing the size of a semiconductor integrated circuit (IC) as depicted in Fig. 1 while increasing the number of functional components is one example of miniaturization and densification.

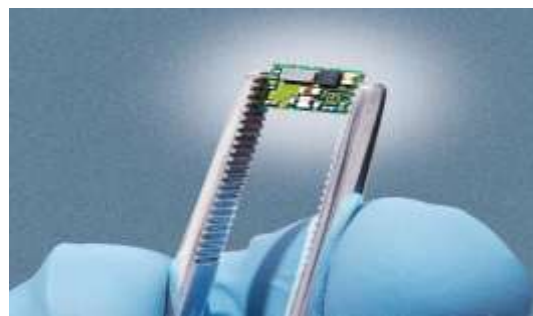


Fig. 1. Sample package miniaturization.

Nowadays, manufacturing solutions such as thickness reduction, package and design densification and dimensional clearance and tolerance improvement are becoming the norm for smaller and densified device.

## II. PACKAGING CHALLENGES

A ball grid array (BGA) device given in Fig. 2 is a type of surface mount packaging used in semiconductor IC capable of multiple input/output (I/O) interconnection requirement. A substrate is the technology used in BGA device to route the connection to the correct layout requirement.

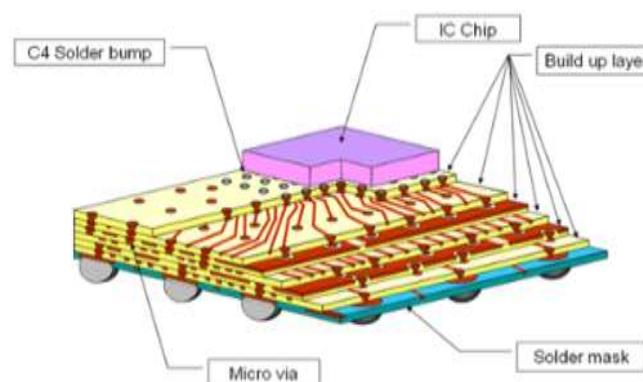


Fig. 2. Package 3D model.

The transition of BGA devices to miniaturized version offers great challenges due to complex interconnect layout that requires more spaces inside the device. These challenges start from the package design and up to the assembly manufacturing processes.

### III. PACKAGE DESIGN SOLUTION

A packaging solution is conceptualized in Fig. 3 offering miniaturization for semiconductor IC packaging. The first die active circuit is where the solder balls are attached and will enable the connection of the IC package to the external printed circuit board (PCB).

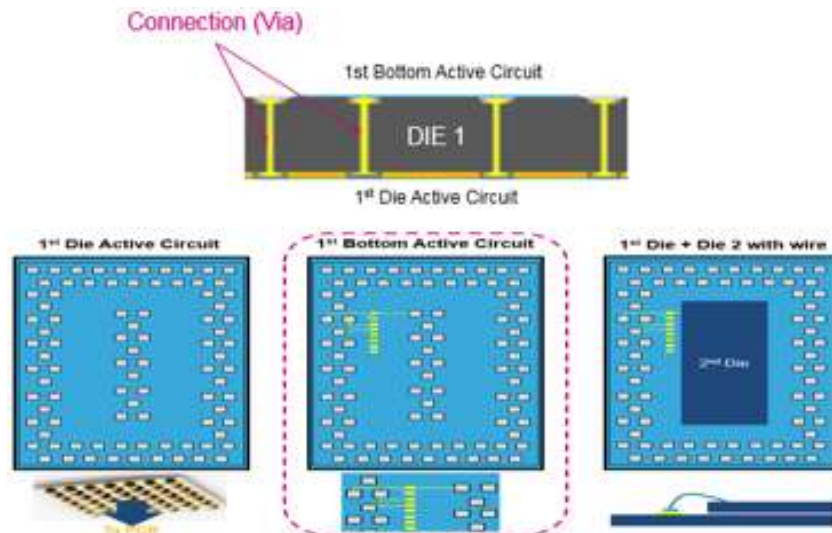


Fig. 3. Design solution for package miniaturization.

The first bottom active circuit is composed of printed or array of conductive materials connected to the first die active circuit. The position of the bondpads depends on the package design requirements. Routing of bondpads is necessary to correctly position the first die bottom active circuit bondpads versus the second die bondpad position. With this configuration, package miniaturization is realized, offering also high I/O densification.