VALTRONICLES
Insights into
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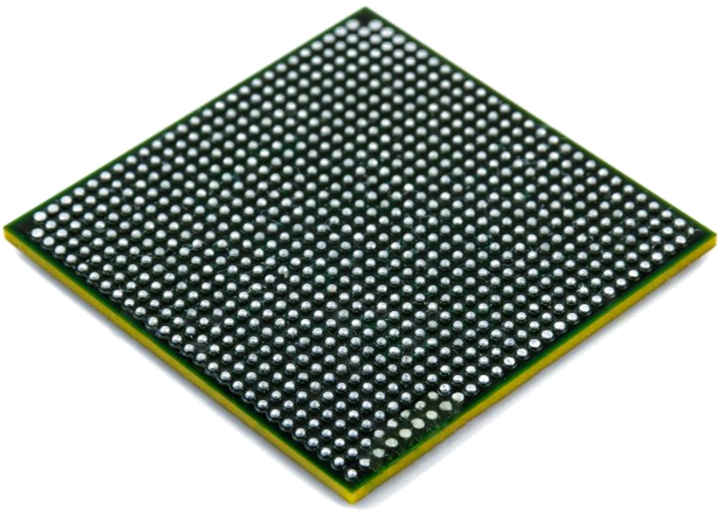
BGA and Micro-FCBGA

A solution for customized components with high-density interconnects

The increasing demand for miniaturized electronic equipment with higher functionality requires fundamental advances in terms of electrical interconnect density and assembly technology. Which assembly technique is best suited for a purpose or application? In this issue of the *Valtronicles*, we will make a review of Ball Grid Arrays (BGAs) and Micro-FCBGA. What are the advantages and disadvantages of these technologies? And what are the challenges on the way to pitch reduction?

What is a BGA?

A BGA or Ball Grid Array is a type of surface mount component that uses solder balls to connect and attach the Integrated Circuit (IC) to the Printed Circuit Board (PCB). As the full surface of the IC can be used, rather than just connections around the edge, BGAs allow to address the requirement of High-Density Interconnects in a reduced space. BGA technology helps considerably reduce the package size.



Advantages, Disadvantages and Utilization of BGAs

Advantages	Disadvantages	Examples of applications
• High interconnection density • Best I/O density for a given PCB area • Reduced footprint • Reduced electrical resistance • Preserved electrical signal integrity • Better heat dissipation • Increased speed of IC • Can be supported with standard assembly equipment	• More prone to stress because of flexural stress from the circuit board and thermal expansion mismatches leading to potential reliability issues • Inspecting of solder balls and solder joints for defects requires X-Ray inspection once the BGA has been soldered onto the circuit board	• Microprocessors/ microcontrollers • ASICs • Memory Medical: • Imaging • Active implants • Ultrasonic probes • Endoscopy

What is a micro-BGA?

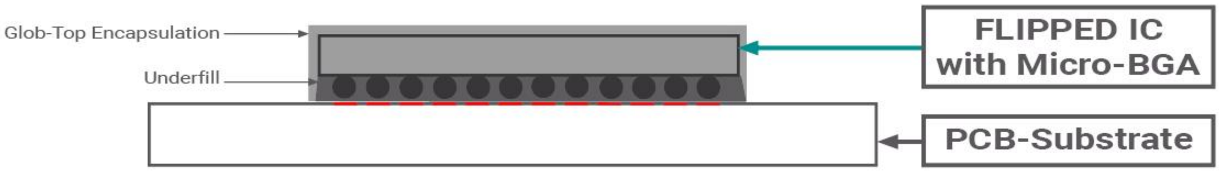
The µBGA is a package that uses much smaller bumps than the traditional BGA. Usual solder balls are 500 to 700µm in diameter with a 400 to 500µm pitch, while a µBGA pitch is much smaller, reaching 150µm or less. µBGAs are key for industries where miniaturization is a driver such as automotive, mobile phones and computers. In the medical device industry too, more functionalities and enhanced power in reduced form factors is setting the trend in the race for innovative portable, wearable, and connected applications.

Pitch size is defined as the distance between consecutive balls on a BGA package, measured from center to center.

Why is Flip-Chip preferred over Wires in µBGA bonding?

The term "flip-chip" refers to an IC that is mounted directly onto a substrate or board in a "face-down" manner. Electrical connection is achieved through conductive bumps built on the surface of the chips, which is why the mounting process is "face-down" in nature. During mounting, the chip is flipped on the substrate or board with the bumps being precisely positioned on their target locations. Because flip chips do not require wire bonding, their size (both lateral and vertical) is much smaller than their conventional counterparts.

Scheme of a µFCBGA



What are the challenges with µFCBGA assemblies?

Because of the BGA's very fine pitch, very small pad sizes, and high I/O count, extremely accurate placement is necessary to achieve maximum mechanical contact and minimize assembly defects. Assembling a printed circuit board (PCB) with ball-grid array (BGA) requires the utmost precision, especially in the case of micro-BGAs. Component placement tolerances must be very tight to obtain highly reliable solder joints. Accurate solder paste stencils, the choice of the right solder paste, and finetuning of the reflow process also play a critical role in avoiding solder defects such as voiding. And last but not least, adapted test solutions are required for such high-density components. Besides the required X-Ray inspection, a strategy has to be implemented for electrical and/or functional tests.

Next Issue - Valtronic Case study

Manufacturing of Micro-FCBGA with 2100 connections and a pitch of 150µm.

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