DataSourceCD Q1-2003: Xilinx Packaging and Thermal Characteristics
Cavity Up Ball Grid Array Packages

Introduction

The BGA packages have become one of the most significant development in packaging technology in recent years. Furthermore, the industry's adoption of the BGA packages as a replacement for the peripheral-leaded quad flat packs (QFPs) is occuring at a very rapid rate for many applications.

BGA is a plastic package technology which utilizes area array solder balls at the bottom of the package to make electrical contact with the system circuit board. The area array format of solder balls reduces package size considerably as compared to leaded products. It also results in improved electrical performance as well as having higher manufacturing yields.

The substrate is made out of a mutilayer BT (bismaleimide triazene) epoxy based material. Power and Ground pins are grouped together and the Signal pins are assigned in the perimeter format for ease of routing on to the board. The package is offered in a cavity up format and contains a wirebonded device that is covered with a mold compound.

Package Construction

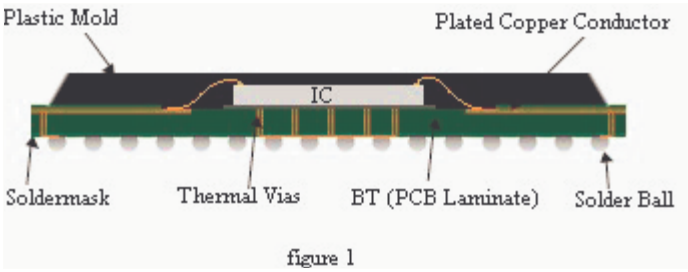

Figure 1: **BGA Package**

Substrate: BT Resin

Solder Ball: 63/37 Sn/Pb

Ball Pitch : 1.00mm - 1.5 mm

Package Height: 2.3 mm

Body size: 17 x 17 - 35 x 35

As shown in the cross section of Figure 1, the BGA package contains a wire bonded die on a single-core printed circuit board with an overmold. Beneath the die are the thermal vias which can dissipate the heat through a portion of the solder ball array and ultimately into the power and ground planes of the system circuit board. This thermal management technique provides better thermal dissipation than a standard PQFP package. Metal planes also distribute the heat across the entire package, enabling a 15–20% decrease in thermal resistance to the case.

Key Features/Advantages of Xilinx BGA Packages

- High board assembly yield since board attachment process is self-centering
- SMT compatible, resulting in minimum capital investment
- Extendable to multichip modules
- Low profile and small footprint
- Improved electrical performance (short wire length)
- Enhanced thermal performance (q_{JA} = 10 to 15°C/w)
- Fine die pad pitch support (to 60 microns)
- Passes Jedec L3 moisture level conditioning
- Passes 1000 Cycles of –40 to 125°C Temperature Cycling at 2nd level / board level

Xilinx BGA Offerings

Xilinx BGAs come in three different pitches: 1.27 mm, 1.5 mm, and 1.00 mm. The 1.0 mm pitch BGAs are part of the Fine Pitch BGA family. By using the Fine Pitch BGAs, a significant reduction in PCB real estate can be achieved. Furthermore, Fine Pitch BGAs provide more I/Os for the same real estate as compared to the standard BGA packages.

Table 1: **BGA Packages**

Package Code	Ball Count	Body Size (mm)	Ball Pitch (mm)	I/Os	Ball Pattern
BG225	225	27 x 27	1.5	192	Full Array
BG256	256	27 x 27	1.27	205	Full Array
FT256	256	17 x 17	1.0	176	Full Array
BG388	388	35 x 35	1.27	-	Peripheral Array
FG256	256	17 x 17	1.0	176	Full Array
FG324	324	23 x 23	1.0	200	Peripheral Array
FG456	456	23 x 23	1.0	312	Full Array
FG676	676	27 x 27	1.0	444	Full Array
FG900	900	31 x 31	1.0	700	Full Array
FG1156	1156	35 x 35	1.0	804	Full Array

Package Drawings

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