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REDUNDANT BALL GRID ARRAY SCHEME TO ENHANCE THE ROBUSTNESS OF PRODUCT DESIGN

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ABSTRACT

Techniques are described herein for a redundant ball grid array (BGA) scheme to enhance the robustness (reliability and manufacturing) of product design. The BGA scheme involves the placement of mechanical dummy balls at a loosened pitch outside of the BGA field. The design is in a scheme that allows for signal routability in a printed circuit board (PCB), while enhancing the mechanical robustness of a BGA or Land Grid Array (LGA) component.

DETAILED DESCRIPTION

Applications that have performance needs greater than 25 Terabytes per second (TB/s), large-sized components are an absolute necessity. Large-sized (e.g., greater than 75 millimeters (mm)) Application-Specific Integrated Circuit (ASIC) BGAs and LGAs show decreased reliability/robustness performance when mounted on a product PCB. Thus, there is a need for methods to enhance the mechanical robustness of large-sized components.

One potential method for enhancing mechanical robustness involves placing no connects or ground/power balls in the corners of a component within the BGA area array field. However, this design scheme generally results in a constraint in terms of routing out signal Inputs/Outputs (I/Os) on the component. This design scheme also reduces the number of balls available in the corners for high speed signal I/O routing applications, which is detrimental to product design. Other alternate methods use edge bonding to enhance robustness, but these methods may be insufficient with regard to very large BGAs (>75mm) where there is significant distance from the edge of the package to the BGA pin field. With these constraints, there does not seem to be a solution in the portfolio of enhancement patches that can enhance the robustness of a component from a design standpoint.

The proposal described herein consists of a unique footprint of mechanical dummy balls outside of the BGA pin field for enhancing the mechanical robustness of a BGA or LGA component.

The layout of the mechanical footprint is such that it does not interfere with routing of the signal I/Os. Routability is accomplished by a loosening down on the pitch. The location of the BGAs added for mechanical robustness is provided in an already present unused area under the substrate of the LGA or BGA component. The BGA scheme would also allows use of edge bonding within the design/process capability.

Figures 1–3 illustrate example details associated with this proposal.

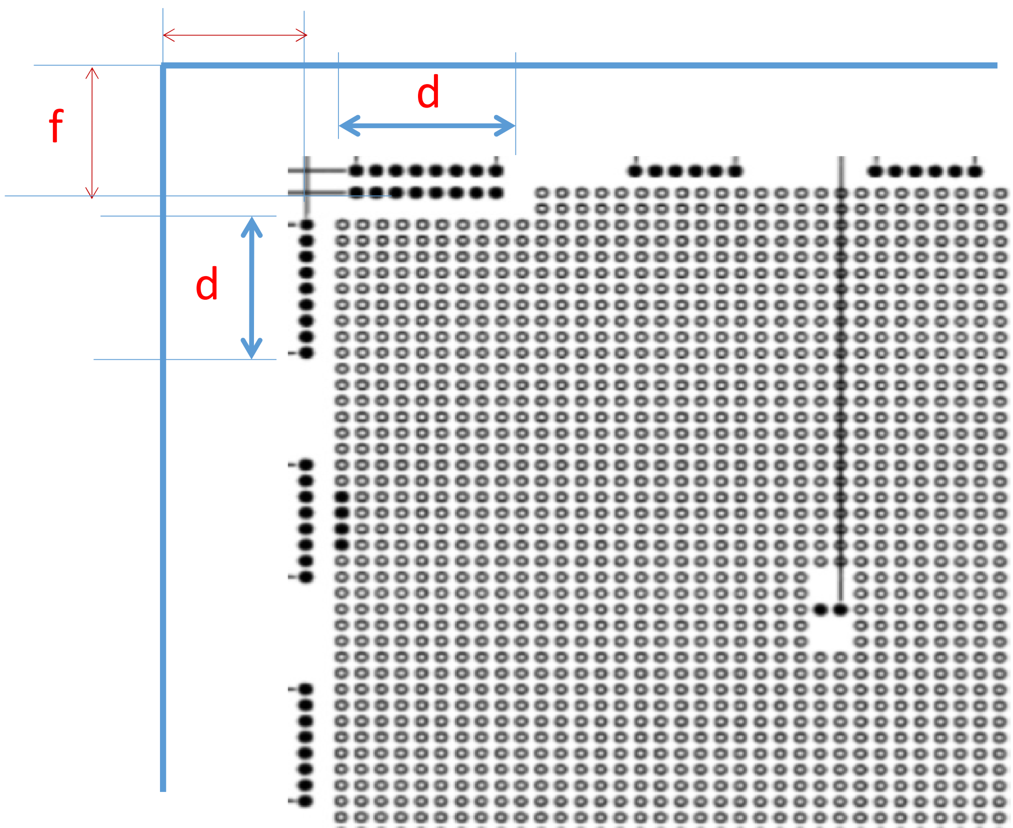

Figure 1

Figure 1 illustrates various dimensions associated with a BGA design scheme for a component in which dummy BGAs are provided outside of the BGA pin field for enhancing the mechanical robustness of the component. For Figure 1, dimension "d" for the dummy BGAs must be a minimum of 8mm (e.g., approximately 4 dummy BGAs).

Dimensions "e" and "f" are dialed in from edge bond process development and could be longer based on need to add additional strength.

Figures 2–3 illustrates features associated with another BGA design scheme with similar philosophy in which outer dummy solder balls (BGAs) are moved toward the edge of a socket based PCB. For the BGA design scheme, the dummy solder ball (BGA) to edge distance may range between approximately 0.5mm – 1mm. Again, dimension "d" is kept at a minimum of 8mm.

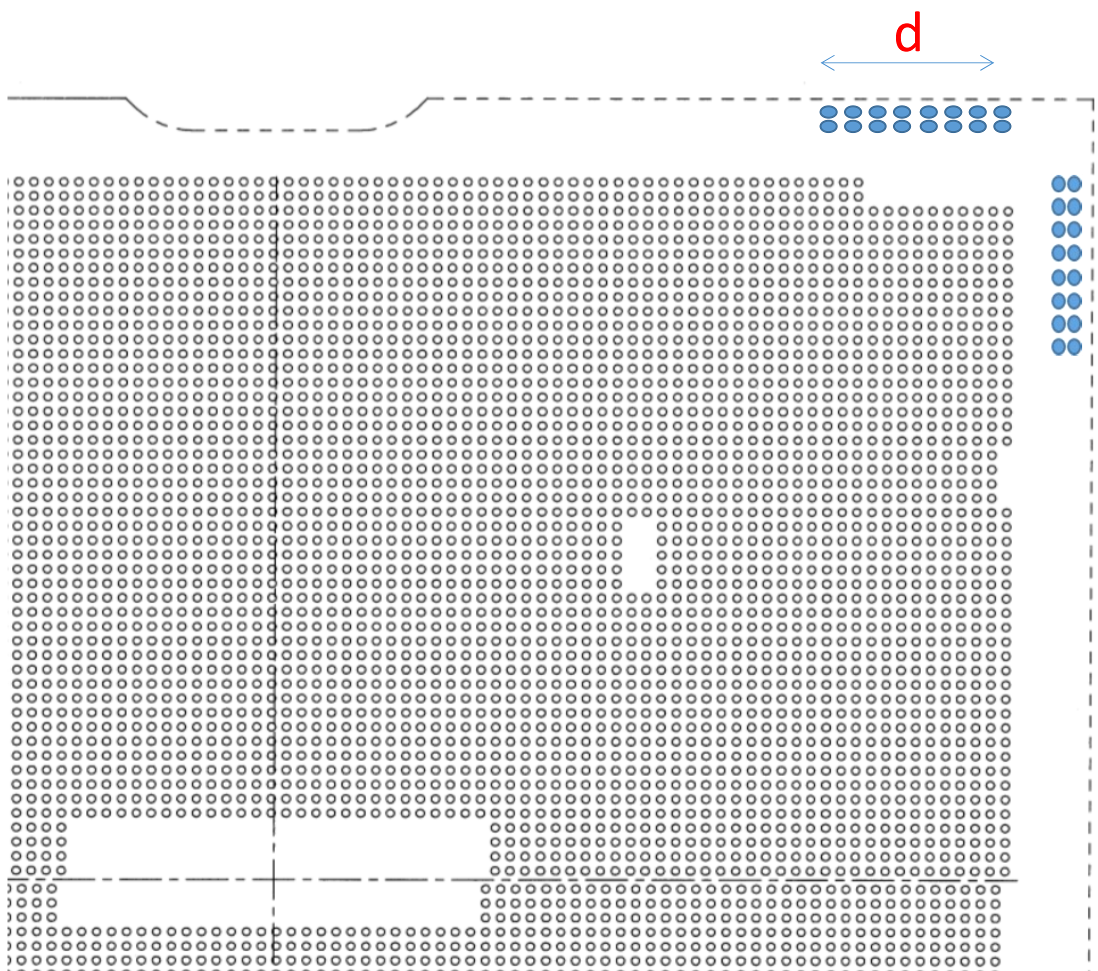

Figure 2

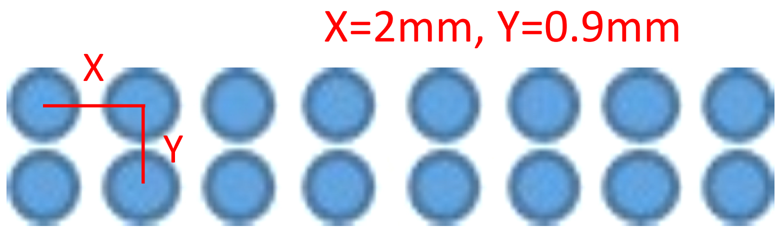

Figure 3

As illustrated in Figure 3, the double rows of the dummy BGA have a loosened "X" and "Y" pitch in this case is specified at X=2mm and Y=0.9mm pitch. The loosened pitch of “X” which is typically a multiple of the broad array pitch would enable with signal routability at the perimeter of the component.

In summary, techniques are described herein for a redundant BGA scheme to enhance the robustness (reliability and manufacturing) of product design. The BGA scheme involves the placement of mechanical dummy balls at a loosened pitch outside of the BGA field. The design is in a scheme that allows for signal routing in a PCB, while enhancing the mechanical robustness of a BGA/LGA component.