

# SEMI G72-0997 (Reapproved 0811) SPECIFICATION FOR BALL GRID ARRAY DESIGN LIBRARY

This Standard was technically approved by the global Assembly & Packaging Technical Committee. This edition was approved for publication by the global Audits and Reviews Subcommittee on July 1, 2011. Available at [www.semiviews.org](http://www.semiviews.org) and [www.semi.org](http://www.semi.org) in August 2011; originally published in September 1997.

**NOTICE:** This Document was reapproved with minor editorial changes.

## 1 Purpose

1.1 The purpose of this Specification is to promote industry use of common BGA designs that may be distinguished by their form, fit, function, and reliability requirements and to record designs by category that meet these requirements.

## 2 Scope

2.1 This Document provides a library of company-sponsored BGA designs for the purpose of promoting the use of these common designs and to minimize the unnecessary proliferation of new designs. New designs will be added as they become sponsored by and approved by member companies.

2.2 This library shall include ceramic, plastic, tape, metal and other (as new categories of designs are identified and added to this specification) BGA designs that are fully compliant with existing JEDEC-registered or standard mechanical outlines. Proposals for new designs may be balloted in parallel with congruent JEDEC registrations or standards, but will not be published in this library until such registration and/or standard is an approved JEDEC outline.

2.3 Controlling dimensions are metric (SI units).

## 3 Referenced Standards and Documents

### 3.1 ASME Standards<sup>1</sup>

ASME Y14.5M-94 — Dimensioning and Tolerancing

### 3.2 JEDEC Standards<sup>2</sup>

JEDEC 95 — Registered and Standard Outlines for Semiconductor Devices

JEDEC 95-1 — BGA Design Guide (Section 14)

J-STD-020 —

JESD 22-A113 — Preconditioning of Plastic Surface Mount Devices Prior to Reliability Testing

### 3.3 Other Documents

SEMI International Standards Compilation of Terms

Regulations Governing SEMI Standards Committees

## 4 Terminology

### 4.1 Definitions

4.1.1 *ball grid array (BGA) package* — a square or rectangular substrate package with an array of metallic balls on one surface of the package. The metallic balls form the electrical and mechanical connection between the package and the PC board or socket.

<sup>1</sup> American Society of Mechanical Engineers, Three Park Avenue, New York, NY 10016-5990, USA; Telephone: 973.882.1170, Fax: 973.882.1717, <http://www.asme.org>

<sup>2</sup> Joint Electron Device Engineering Council, 3103 North 10<sup>th</sup> Street, Suite 240-S, Arlington, VA 22201, USA; Telephone: 703.907.7560, Fax: 703.907.7583, <http://www.jedec.org>

4.2 *column grid array* — same as ball grid array except that metallic columns are used in place of the metallic balls for the electrical and mechanical interconnection between the package and the PC board.

NOTE 1: In the text of this Specification, whenever ball grids are mentioned, a reference to column grids is also implied.

4.3 *wire bond ring* — metalized area in the shape of a complete or partial ring surrounding the die mounting area intended for group electrical interconnections.

## 5 Ordering Information

5.1 *Order of Precedence* — To avoid conflicts, the order of precedence when ordering ball grid array substrates or assembled packages when using BGA Library Designs from this Specification shall be as follows:

- a. Purchase Order
- b. Customer BGA Drawing
- c. BGA Library Design from this specification
- d. Referenced Standards and Documents from § 3
- e. Other related documents

## 6 General Design Characteristics Listing Format

6.1 Each design addition to this library shall include a general design characteristics description which shall be listed in Appendix 1 of this Specification and also be formatted on top of the title block for each design drawing.

6.1.1 Description listings in the General Design Characteristics, Appendix 1 shall be organized into category sections: Plastic, Ceramic, Tape, Metal, or Other.

6.1.2 These descriptions shall be listed across a row of characteristics classification columns and may determine the uniqueness of each design.

6.2 The characteristics classification columns may be used in a data base format to sort the design listings sequentially, top to bottom according to their sequential listing by column, left to right, in the following order. These listings and their descriptive designations are as follows:

6.2.1 *Ball Count* — List the actual number of balls on the package.

6.2.2 *Signal I/O* — List the available balls for individual signal I/O. This does not include balls that are interconnected with other balls, bond rings, power or ground planes or other electrically interconnected features, such as die attach pads.

6.2.3 *Body Size* — List ##×## (i.e., 27×27) to represent JEDEC 95 registration values in millimeters for “D” and “E” nominal body dimensions.

6.2.4 *Pitch* — List number representing JEDEC 95 registration values in millimeters for the “e” pitch dimension.

6.2.5 *Matrix* — List ##×## (i.e., 20×20) to represent JEDEC 95 matrix values determined by the number of balls on the outside row and column.

6.2.6 *Array* — List either Full, Staggered, Peripheral, or Depopulated:

- *Full* — Completely filled matrix, as defined by the JEDEC 95 registration and variation shown for each design.
- *Staggered* — A full matrix which has been depopulated by every other ball in each row and column.
- *Peripheral* — Balls missing in the center of the BGA package. Outer rows of the matrix are fully populated.
- *Depopulated* — Any variation not described by full, staggered, or peripheral as described above.

NOTE 2: Any of the above matrix designs may have one ball missing from its defined matrix description above, for purposes of package orientation, and still be classified according to that description.

6.2.7 *Thermal Enhancement* — List #×# (i.e., 6×6) or “Cu Slug,” to designate either a specific matrix of balls for thermal enhancement purposes or copper heat slug for the same. Other metal slugs may be listed by their appropriate metal constituent. List “N/A” if the design has no thermal enhancement.