

JEDEC DESIGN STANDARD

DESIGN REQUIREMENTS FOR OUTLINES OF SOLID STATE AND RELATED PRODUCTS

JEDEC PUBLICATION 95

DESIGN GUIDE 4.25

FINE-PITCH, LAND GRID ARRAY PACKAGE, SQUARE AND RECTANGULAR (FLGA, FRLGA)

**JEDEC
SOLID STATE TECHNOLOGY ASSOCIATION**

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FINE-PITCH, LAND GRID ARRAY PACKAGE DESIGN REQUIREMENTS

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4.25 Fine-pitch, Land Grid Array Package (FLGA)

4.25.1 Introduction

A Fine-pitch, Land Grid Array (FLGA) has an array of metallic lands on the underside of the package. The substrate or carrier of the package may have a square or rectangular shape with a metalized circuit pattern applied to either or both sides of a dielectric structure. The semiconductor die is attached to the top surface of this dielectric carrier. On the underside of the dielectric the array pattern of metallic lands provides the mechanical and electrical connection from the package body to the next level component such as a printed circuit board. The surface to which the die is attached may be encapsulated by various techniques to protect the semiconductor.

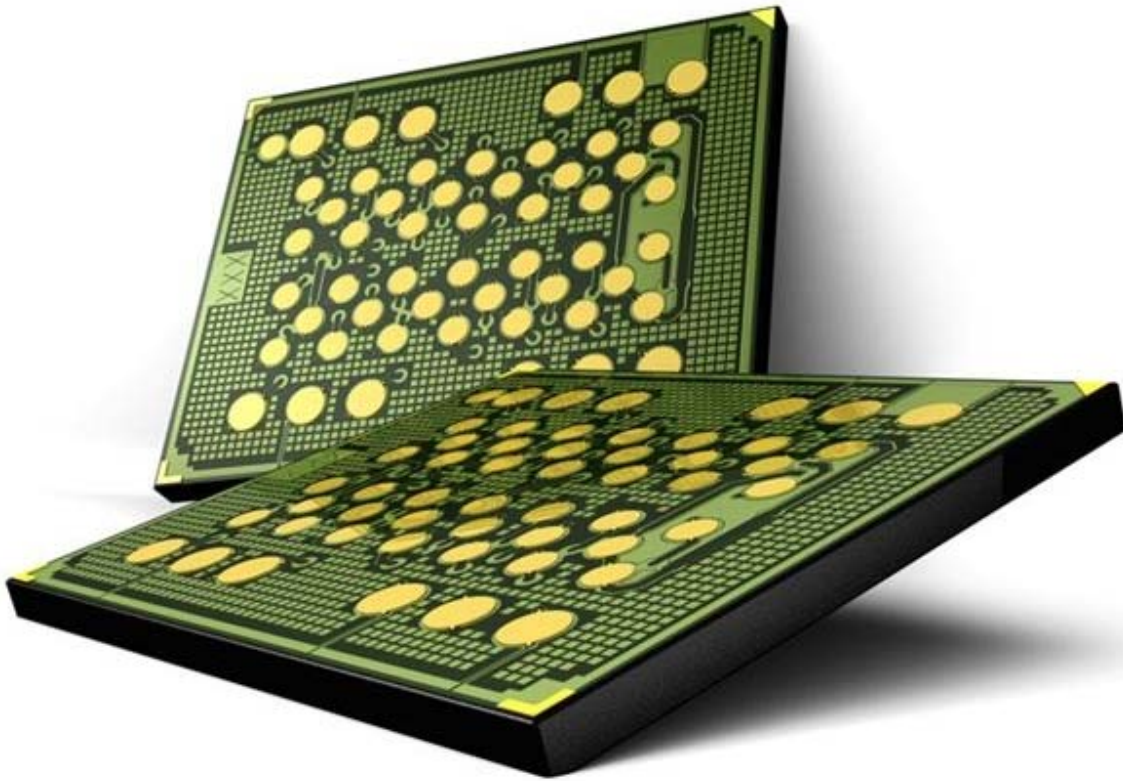


FIGURE 4.25-1 — Fine-pitch, Land Grid Array Packages (FLGA)

4.25.2 Scope

This Design Requirement defines the symbols, definitions, algorithms, and specified dimensions and tolerances for Fine-pitch, LGA packages. The guidelines defined are based on hard metric dimensions and adhere to the geometric dimensioning and tolerancing principles defined in ASME Y14.5M-1994.

This section of JEP95 is a companion to Design Guide 4.5 for Fine-pitch, Square BGA (FBGA) outlines and Design Guide 4.6 for Fine-pitch, Rectangular BGA (FRBGA) outlines.

This design guide does not attempt to document all FLGA designs being produced. It establishes the design requirements that shall be followed for future FLGA outlines included in JEP95.

4.25.3 Terms and Definitions

4.25.3.1 Fine-pitch Land Grid Array Package

A fine-pitch land grid array package whose body size (length D and width E) is defined without regard to a specific die size. The body dimensions are intended to accommodate assembly of die with various sizes, and usually will not change as a result of future die shrinks for a specific device function. Some type of encapsulant or lid usually covers the extended portion of the substrate.

4.25.3.2 Flanged-Type FLGA Package

FLGA with a package outline (length, width) defined by a package flange part, mostly substrate, extending outward beyond the perimeter of a molded part or of a flip-chip-bonded part.

NOTE Flanged-type FLGA, shown in Figure 4.25-2, is generally cut by singulation press.

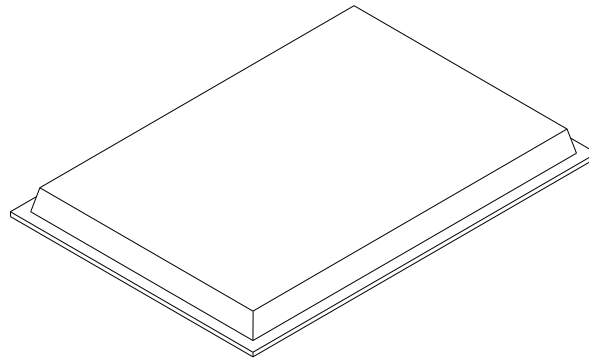


FIGURE 4.25-2 — Flanged-Type FLGA Package

4.25.3.3 Sawn-Type FLGA Package

FLGA with a package outline (length, width) defined by a molded part with no extending flange part.

NOTE Sawn-type FLGA, shown in Figure 4.25-3, is generally cut by dicing.

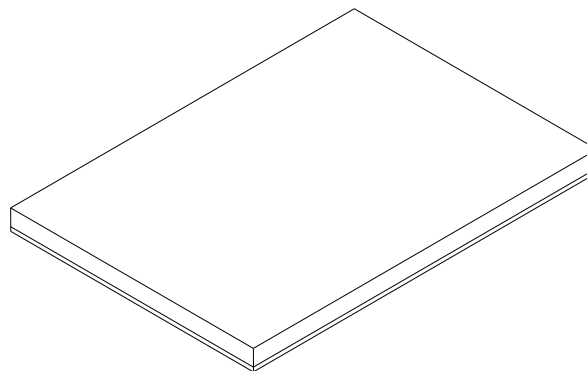


FIGURE 4.25-3 — Sawn-Type FLGA Package

4.25.3 Terms and Definitions (cont'd)

4.25.3.4 Descriptive Designator

The common designator for FLGA packages takes the form <profile><pitch><aspect>LGA. In this section of JEP <profile> takes values as specified in JESD30, <pitch> takes the value F (for Fine-pitch) and <aspect> takes the value R (for Rectangular).

Refer to JEDEC Standard 30 (JESD30) for Descriptive Designators.

4.25.3.5 Land Contact

The contacts on the FLGA are metallic lands which are part of the metalized circuit pattern applied to the bottom side of a dielectric structure. Typically, the lands consist of nickel/gold plating over copper. For purposes of this document, these contacts of whatever form will be referenced generically as "lands".

4.25.3.6 Seating Plane

The seating plane is a plane simulated by contact of the package bottom in three non-collinear areas that support the freestanding package when it is placed on a reference surface. (More than 3 areas may contact this reference surface, but at least 3 areas are required to define the seating plane.) This surface becomes the basis for all measurements with respect to Datum C.

The triangle formed by the three areas defining the seating plane shall include the center of gravity of the device as projected on the resulting plane. If multiple seating planes exist, then the seating plane resulting in the worst coplanarity condition shall be used for all measurements.

4.25.3.7 Profile Height

The profile height, A, of an FLGA is the distance from the seating plane to the highest point on the package body. This distance is measured perpendicular to the seating plane.

4.25.4 Design Requirements

4.25.4.1 Body Size

The D and E dimensions define the body size for an FLGA. Dimension D is the size of the body measured parallel to the major axis of the package and dimension E is the size measured parallel to the minor axis. Thus, for rectangular packages D will always have a larger value than E.

Dimensions D and E are BASIC dimensions with values defined on 0.5 mm increments. Variations in size and orientation are controlled by profile tolerance aaa (Table 4.25-1).

4.25.4.2 Matrix Size

MD and ME represent the matrix size corresponding to body dimensions D and E respectively. The values of MD and ME for a specific FLGA package may be less than the maximum permitted value (4.25.4.4). The full matrix represented by MDxME must be located symmetrically on the package body with respect to datums A and B (4.25.4.7). For packages with a rectangular land matrix, MD is larger than ME.

When selecting the matrix size, the designer should consider issues relating to handling and shipping systems and to the use of sockets.

4.25.4.3 Matrix Pitch

The matrix pitch for an FLGA will not necessarily be equal for the D and E dimensions. In these cases eD and eE represent the pitches corresponding to body dimensions D and E respectively. When the pitches are not equal, land dimensions and tolerances for the smaller pitch will govern the classification of the package. When eD and eE are equal, the symbol e may be used for both.

4.25.4 Design Requirements (cont'd)

4.25.4.4 Maximum Matrix Size

The maximum permitted values for MD or ME for any values of D or E are determined by the following formulas:

$$MD(max) = \frac{[(D - aaa) - (b1max + eee) - (2 \times 0.13)]}{eD} + 1 \quad \text{Truncated to an integer}$$

$$ME(max) = \frac{[(E - aaa) - (b1max + eee) - (2 \times 0.13)]}{eE} + 1 \quad \text{Truncated to an integer}$$

NOTE 1 The minimum clearance between the edge of the outermost row or column of lands and the edge of the body shall be 0.13 mm per side when D or E are at their minimum value and b1 is at its maximum value (as used in the above formulas).

NOTE 2 When the array pitch is constant, e would be substituted for eD and eE.

NOTE 3 b1 is the largest of the FLGA's land contacts, b2 is the smallest of the FLGA's land contacts.

NOTE 4 The maximum permitted land count (Nmax) is determined by $Nmax = MD(max) \times ME(max)$.

NOTE 5 See Table 4.25-1 and Table 4.25-2 for symbol definitions.

NOTE 6 Formula is used to determine maximum MD and ME for SMD packages. For NSMD packages it is recommended that the solder mask opening be 0.075 mm larger than the solder ball pad and that the outermost solder mask opening be at least 0.150 mm from the package edge. Please refer to your company's design requirements as they may be different.

4.25.4.5 Depopulation

Depopulation is the omission of lands from a full matrix defined by MD and ME. Any depopulation pattern is allowed. Figure 4.25-4 illustrates some possible depopulated matrix patterns.

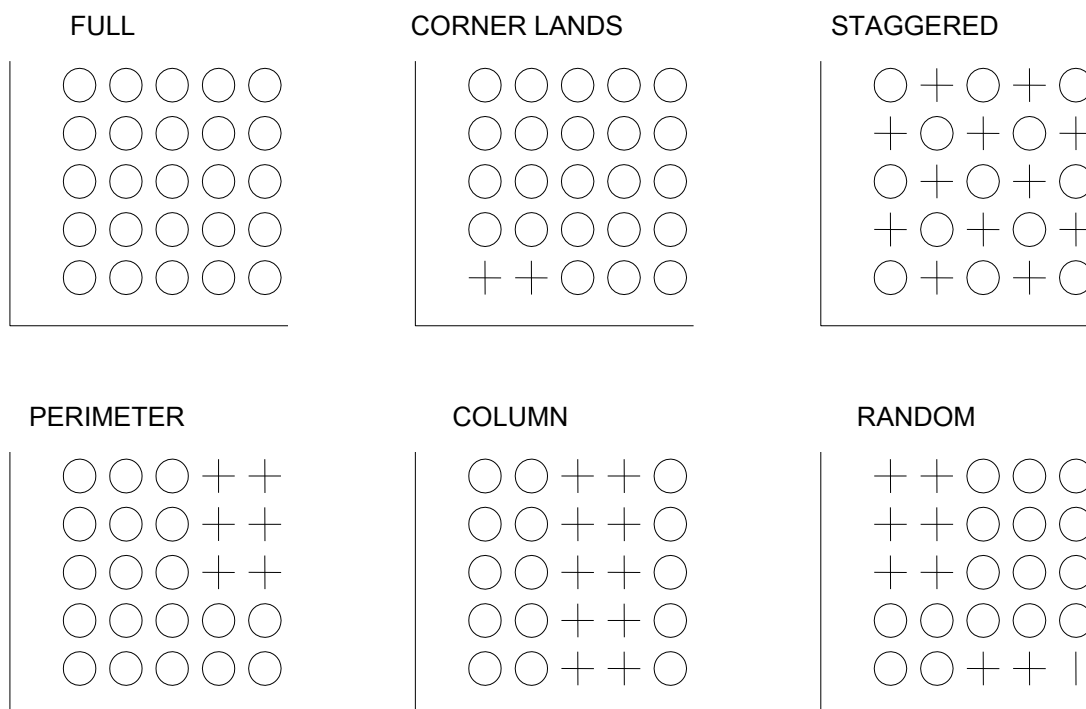


FIGURE 4.25-4 — Examples of Depopulated Matrix Patterns (+ = Depopulated Land Locations)