

SEMI G33-90

SPECIFICATION FOR PRESSED CERAMIC PIN GRID ARRAY PACKAGES

1 Preface

This specification defines the acceptance criteria for ceramic pin grid array packages produced using pressed ceramic, mechanically inserted pins and solder for electrical interconnection of pins.

2 Applicable Documents

2.1 ANSI Specification¹

Y14.5 — Dimensioning and Tolerancing

2.2 ASTM Specification²

B 152 — Copper Metal Specification

2.3 Federal Specification³

QQ-N-290A — Nickel Plating

QQ-S-571E — Solder-Alloy Compositions

2.4 Military Specifications³

MIL-STD-105 — Sampling Procedures and Tables for Inspection by Attributes

MIL-STD-883 — Test Methods and Procedures for Microelectronics

MIL-G-45204 — Gold Plating, Electrodeposited

MIL-M-38510 — General Specification for Microcircuits

2.5 JEDEC Specification⁴

Pub. No. 95 — Registered and Standard Outlines for Semiconductor Devices

3 Selected Definitions

blister (bubble) ceramic — Any separation within the ceramic which does not expose underlying ceramic material.

blister (bubble) metal — Any localized separation within the metallization or between the metallization and ceramic which does not expose underlying metallization or ceramic material.

burr — An adherent fragment of excess parent material at the component edge.

chip — A region of ceramic missing from the surface or edge of a package which does not go completely through the package. Chip size is given by its length, width and depth from a projection of design planform (see Figure 1).

crack — A cleavage or fracture that extends to the surface of a package which may or may not pass through the entire thickness of the package.

contact pad — That metallized pattern that provides mechanical or electrical connection to the external circuitry.

die attach surface — A dimensional outline designated for die attach.

dielectric — A material applied to the surface of a package which provides such functions as electrical insulation, passivation of underlying metallization and limitation of solder flow.

discoloration — Any change in the color of the package metallization as detected by the unaided eye.

flatness — The allowable deviation of a surface from a reference plane. The tolerance zone is defined by two parallel planes within which the surface must lie.

footprint — Pin pattern.

foreign material — An adherent particle other than parent material.

isolation gap — Metal-free space between conductive areas.

peeling (flaking) — Any separation of metallization from the base material exposing the base material.

pit — Any unspecified depression in the package.

post-metallization — The process by which metallization is applied to a body (substrate) after the body has been fully sintered.

projection — An adherent fragment of parent material on the package surface.

pullback — The linear distance between the edge of the ceramic and the first measurable metallization and/or glass interface (see Figure 2).

refractory metallization — The process by which a high melting point (typically in excess of 1800°C) metal or

1 ANSI, 1430 Broadway, New York, NY 10018

2 American Society of Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959

3 Military Standards, Naval Publications and Form Center, 5801 Tabor Avenue, Philadelphia, PA 19120

4 JEDEC, 2001 Eye Street N.W., Washington, D.C. 20006

combination of metals is applied to a suitable substrate and fired.

rundown — The vertical extension of metallization from the ceramic (see Figure 2).

seal area — A dimensional outline area designated to provide a surface for sealing.

seating plane — Defined by the standoff features or the package base plane if no standoff is used (see Figure 3).

SLAM — Abbreviation for “Single Layer Alumina Metallization,” which denotes a package design without a physical die attach cavity.

solder — An alloy with a melting point equal to or less than 427°C.

standoff — The designed separation between the base plane and the seating plane created by a physical feature. Standoff use, configuration, and placement is optional (see Figure 3).

terminal — Case outline at point of entry or exit of an electrical contact.

thick film metallization — The process by which a thin layer of metal (usually in the 0.3 to 1.0 μm range) is applied to a suitable substrate by methods including sputtering, vacuum evaporation and chemical vapor deposition.

TIR — Total Indicator Reading.

window frame — A separate member of ceramic which is joined to the surface of the package on which a flat lid is attached for sealing.

4 Ordering Information

Purchase orders for pin grid array packages furnished to this specification shall include the following items:

1. Drawing number and revision level
2. Certification requirements
3. Quantity
4. Reference to this document
5. Any exceptions to print or specifications

5 Dimensions and Permissible Variations

The dimensions of the pin grid array package shall conform to SEMI Standards or to the customer drawing, and be within the outline of the appropriate JEDEC standard.

6 Material Parameters

The definitions, defects, and functional testing described in this specification relate directly to a nominal package made with the following materials. They may also be applicable to similar pin grid array packages made with other materials.

6.1 Ceramic Properties

6.1.1 *Materials* — Alumina content 90% minimum. Beryllia content to be in excess of 98.5% BeO.

6.1.2 *Color* — Dark or white.

6.2 Metal Properties

6.2.1 Plating

6.2.1.1 Plating finish shall be per MIL-M-38510; Nickel Plating (if designated) shall be per QQ-N-290A, 50 μm –350 μm (0.1300 mm–0.08890 mm). Gold plating (if desired) shall conform to MIL-G-45204, Type III and 50 μm –225 μm (0.1300 mm–0.05080 mm).

6.2.2 Metallization

6.2.2.1 Metallized circuits and areas can be thick film, thin film or refractory post-metallized. Such metallization materials may be, but are not limited to, the following:

1. Thick Film Materials

- a. Gold (Au) and Gold Alloys
- b. Silver (Ag)
- c. Silver - Platinum - Palladium (AgPtPd)
- d. Silver - Palladium - Platinum (AgPdPt)
- e. Copper (Cu)

2. Thin Film Materials

- a. Copper (Cu)
- b. Chromium (Cr)
- c. Nickel (Ni)
- d. Titanium (Ti)

4. Refractory Materials

- a. Molybdenum - Manganese (MoMn)
- b. Molybdenum - Tungsten (MoW)

6.2.3 *Solder* — Solder compositions used in the manufacture of pressed ceramic pin grid array packages shall include, but not be limited to, the following, per QQ-S-571E:

1. 10/90 — 10% Sn/90% Pb