

SEMI G2-94

SPECIFICATION FOR METALLIC LEADFRAMES FOR CER-DIP PACKAGES

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NOTICE: This Standard or Safety Guideline has an Inactive Status because the conditions to maintain Current Status have not been met. Inactive Standards or Safety Guidelines are available from SEMI and continue to be valid for use.

1 Preface

1.1 *Purpose* — This Specification defines the materials and dimensions for the metallic leadframe (stamped or etched) used in the construction of Cer-DIP Package.

1.2 *Scope* — The criteria detailed in this Document applies to the iron-nickel leadframe (MIL-M-38510 Type A or Type B) used in Cer-DIP packages.

1.3 *Units* — U.S. Customary (inch-pound) or metric (SI) units may be used at the customer's discretion. This Specification uses the U.S. Customary units as the prime unit.

2 Referenced Standards and Documents

2.1 *Military Specifications*¹

MIL-I-23011 — Iron/Nickel Alloys for Sealing to Glasses and Ceramics

MIL-M-38510 — General Specifications for Microcircuits

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

2.2 Related information may also be found in:

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

3 Terminology

3.1 *Definitions*

3.1.1 *bonding area* — coined area on bond fingers within a distance of 0.762 mm (0.030 in.) from lead tips.

3.1.2 *bottom formed width* — See Figure 3.

3.1.3 *bow* — curvature of the leadframe strip in the vertical plane; see Figure 1.

3.1.4 *burr* — fragment of excess parent material attached to the leadframe edges.

3.1.5 *camber* — curvature of the leadframe strip edge in the horizontal plane; see Figure 2.

3.1.6 *coined area* — the area of the bond fingers planished to produce a flattened area for functional use; see Figure 3.

3.1.7 *coplanarity* — the total indicator reading difference of the lead tips in the Z direction.

3.1.8 *datum plane* — M is datum plane; see Figure 3.

3.1.9 *discoloration* — A darkening or staining of the aluminum (metallization).

3.1.10 *foreign material* — any adhering residue which is not part of the leadframe composition.

3.1.11 *pit* — a shallow surface depression or crater with a visible edge.

3.1.12 *planarity* — total indicator reading of the lead tips in the Z direction relative to datum M.

¹ United States Military Standards, Available through the Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120-5099, USA; Telephone: +1.215.697.3321.

- 3.1.13 *projection* — a raised portion of the surface indigenous with the parent material, other than a burr.
- 3.1.14 *slug marks* — random dents in the leadframe.
- 3.1.15 *stamped leadframe terminology* — see Figure 3.
- 3.1.16 *tilt* — the deviation of the plane of the coined area from a condition parallel to the plane on datum M.
- 3.1.17 *top formed width* — see Figure 3.
- 3.1.18 *twist* — the angular rotation of one end of the leadframe or strip with reference to the other end; see Figure 4.
- 3.1.19 *void* — an absence of aluminization from a designated area of the leadframe.

4 Ordering Information

- 4.1 Purchase order for Cer-DIP metallic leadframes furnished to this Specification shall include the following items:
- 4.2 Current drawing of the leadframe showing all dimensions and tolerances, including the location of the metallization layer.
- 4.3 Material,
- 4.4 Number of leads,
- 4.5 Material tensile strength,
- 4.6 Metallization thickness and type,
- 4.7 Form of leadframes (i.e., singles, scored strips, or unscored strips),
- 4.8 Number of frames per strip; as applicable,
- 4.9 Material certification,
- 4.10 Packaging and marking.

5 Dimensions

- 5.1 All Dimensioning and tolerancing shall conform to Y14.5. Table 1 presents standard leadframe dimensions.

6 Materials

- 6.1 *Leadframe Base Material* — Tensile strength shall be specified per MIL-I-23011.
 - 6.1.1 *Chemical Composition* — Shall conform to the requirements of MIL-M-38510, Type A or B.
 - 6.1.2 *Material Tensile Strength* — Shall be supplied per MIL-I-23011.
- 6.2 *Metallization* — Aluminum.
 - 6.2.1 *Thickness* — 100 microinches minimum, 600 microinches maximum (micromin, micromaximum).
 - 6.2.2 *Coverage* — 0.030 in. (0.762 mm) minimum; measured from lead tip. Maximum to be determined by ceramic size.
 - 6.2.3 *Composition*
 - 6.2.3.1 *Clad Material* — 99.4% minimum aluminum.
 - 6.2.3.2 *Vapor Deposition* — 99.9% minimum aluminum.

NOTE 1: The two types of aluminum may exhibit different visual appearances and non-functional characteristics after processing.

7 Defect Limits

- 7.1 *Burrs*
 - 7.1.1 *Horizontal*
 - 7.1.1.1 *Bonding Area* — 0.001 in. (0.025 mm) max.

7.1.1.2 *Other Areas* — 0.002 in. (0.051 mm) max.

7.1.2 *Vertical*

7.1.2.1 *Bonding Area* — 0.001 in. (0.025 mm) max.

7.1.2.2 *Other Areas* — 0.002 in. (0.051 mm) max.

7.2 *Planarity/Coplanarity* — Shall not exceed the limits shown in Table 2.

7.3 *Foreign Materials* — Leadframes shall be clean and free from foreign material such as photoresist, lubricants, solvent residue, water marks, and rust spots. Protective coatings acceptable to both vendor and user are not considered foreign material.

7.4 *Pits and Slug Marks*

7.4.1 *Bonding Area* — 0.001 in. (0.025 mm) max. surface dimension $\times$ 0.0005 in. (0.013 mm) maximum depth.

7.4.2 *Other Areas* — 0.010 in. (0.254 mm) max. surface dimension $\times$ 0.0005 in. (0.013 mm) maximum depth.

7.5 *Projections*

7.5.1 *Bonding Area* — None allowed.

7.5.2 *Other Areas* — 0.010 in. (0.254 mm) max. surface dimension $\times$ 0.002 in. (0.015 mm) maximum height.

7.6 *Scratches* — There shall be no scratches in the aluminum metallization that penetrate to the underlying base material.

7.7 *Voids* — All metallized areas of the leadframe within the bonding area shall have no voids larger than 0.001 in. (0.025 mm) in any dimension.

7.8 *Twist (formed leadframe strip)* — 0.004 in. per inch (0.102 mm).

7.9 *Coining*

7.9.1 *Coined Depth* — Minimum 0.0005 in. (0.013 mm); maximum 0.002 in. (0.051 mm). Minimum coined depth may be controlled by minimum flat area.

7.9.2 *Coined Flat Area* — Minimum of 80% of normal lead width; measured 0.005 in. (0.127 mm) back from lead tip.

7.9.3 *Coined Length* — Minimum 0.025 in. (0.635 mm) from lead tip.

7.10 *Lead Position*

7.10.1 *Lead Position* — A 0.007 in. (0.178 mm) diameter circle must be 100% within nominal lead position when centered at lead nominal centerline and 0.007 in. (0.178 mm) back from lead tip.

7.10.2 *Minimum Spacing* — 0.006 in. (0.152 mm) minimum.

7.11 *Bowing*

7.11.1 *Convex* — 0.0025 in. per inch (0.0025 mm per mm) maximum.

7.11.2 *Concave* — 0.0025 in. per inch (0.0025 mm per mm) maximum.

7.12 *Camber* — 0.005 in. per inch (0.005 mm per mm) maximum.

NOTE 2: Items 7.11 and 7.12 refer to scored strips only.

8 Sampling

8.1 Sampling will be determined between vendor and customer.

9 Test Methods

9.1 *Sequence of Events and Tests*

9.1.1 The sequence of testing should be: