

SEMI G41-0317

SPECIFICATION FOR DUAL STRIP SOIC LEADFRAME

This Standard was technically approved by the Assembly & Packaging Global Technical Committee. This edition was approved for publication by the global Audits and Reviews Subcommittee on December 8, 2016. Available at www.semiviews.org and www.semi.org in March 2017; originally published in 1987.

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1 Purpose

1.1 This Specification is a guideline for high volume production of leadframes, including internal package plating, for plastic molded Single Outline Integrated Circuit (SOIC) semiconductor packages.

2 Scope

2.1 This Specification is used by packaging engineers, leadframe manufacturers and mold manufacturers. This Specification is designed to meet the requirements of automated assembly.

2.2 SOIC Dual Standard Dimensions is described for narrow body of 0.150 in. width and wide body of 0.300 in. width. See Table 1, and Figures 7 through 14. The unit in these figures is inch.

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3 Referenced Standards and Documents

3.1 SEMI Standards and Safety Guidelines

SEMI G4 — Integrated Circuit Leadframe Materials used in the Production of Stamped Leadframes

SEMI G10 — Mechanical Measurement for Plastic Package Leadframes

3.2 U.S. Military Specifications¹

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

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

NOTICE: Unless otherwise indicated, all documents cited shall be the latest published versions.

4 Terminology

4.1 Definitions

4.1.1 *burr* — a fragment of excess material either horizontal or vertical attached to the leadframe.

4.1.2 *camber* — curvature of the leadframe strip edge (see Figure 1).

4.1.3 *coil set* — longitudinal bowing of the leadframe (see Figure 2).

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.

4.1.4 *coined area* — that area at the tip end of the bond fingers coined to produce a flattened area for wire bond (see Figure 3).

4.1.5 *crossbow* — transverse bowing of the leadframe (see Figure 4).

4.1.6 *functional area* — the die attach pad and the lead tips.

4.1.7 *lead twist* — angular rotation of bonding fingers (see Figure 5).

4.1.8 *pits* — shallow surface depressions or craters in the leadframe material.

4.1.9 *slug marks* — random dents in the leadframe caused by foreign material in the stamping die.

4.1.10 *stamped leadframe terminology* — see Figure 6.

4.1.11 *Z plane* — lead and pad planarity require a reference in the Z dimension. The recommendation for the reference plane, hereafter called the Z plane, is the average of the two dambars when measured at their geometric center. This reference method is incorporated into SEMI G10.

5 Ordering Information

5.1 Purchase orders for SOIC leadframes furnished to this Specification shall include the following items:

1. Part specification number and revision level
2. Material
3. Number of leads
4. Material certification
5. Packaging and marking (see § 10)

6 Requirements

NOTE 1: The official values in this specification are expressed in The International System of Units (SI). Values that:

- are expressed in Inch-Pound (also known as ‘US Customary’ or ‘English’) units,
- are enclosed in parentheses,
- directly follow values expressed in SI units, and
- are not official, are provided for reference only, and might not be exact conversions of the SI values.

6.1 Internal Frame Area

6.1.1 *Minimum Flat Wire Bonding Area* — 80% of nominal lead width and 0.381 mm (0.015 in.) in length.

6.1.2 Coin Depth

6.1.2.1 0.20 mm (0.008 in.) frame material thickness: 0.013 mm (0.0005 in.) minimum/0.02 mm (0.001 in.) maximum.

6.1.2.2 0.25 mm (0.010 in.) frame material thickness: 0.013 mm (0.0005 in.) minimum/0.05 mm (0.002 in.) maximum.

NOTE 2: Maximum coin depth may also be constrained by minimum lead spacing requirement given in § 6.1.3. Minimum coin depth may also be constrained by minimum bond area requirement given in ¶ 6.1.1.

6.1.3 X-Y Plane Lead Spacing and Location

6.1.3.1 Spacing between two leads to be 0.152 mm (0.006 in.) minimum.

6.1.3.2 Leads to be located so that a 175mm (0.007 in.) diameter circle centered on the nominal center of the coined lead in width and 0.152 mm (0.006 in.) back from lead tip in length shall be totally encompassed by the coined area.

6.1.4 *Die Attach Pad Location* — Die attach pad to be located within ± 0.151 mm (0.002 in.) as measured from the centerline of the reference plane in the side rail.

6.1.5 *Lead Twist* — Shall not exceed 0.015 mm (0.0006 in.) per 0.254 mm (0.010 in.) of lead width.

6.1.6 Die Attach Pad Tilt and Flatness

6.1.6.1 *Tilt* — 0.025 mm (0.001 in.) maximum per 2.54 mm (0.100 in.) length in the undepressed state. 0.051 mm (0.002 in.) maximum per 2.54 mm (0.100 in.) length in the depressed condition.

6.1.6.2 *Flatness* — 0.0005 mm (0.0002 in.) when measuring from the center to the average of the four corners. The corners are defined at 0.127 mm (0.005 in.) from each edge.

6.1.7 *Die Attach Pad Downset* — ± 0.051 mm (0.002 in.) as measured from the center of the pad to a point on the support bar strip. The nominal downset recommended is 0.30 mm (0.012 in.) for 0.25 mm (0.010 in.) thick material and 0.20 mm (0.008 in.) for 0.20 mm (0.008 in.) thick material.

6.1.8 Lead and Die Attach Pad Coplanarity

6.1.8.1 *Coplanarity* — The relationship between the leads and die attach pad to the Z plane.

6.1.8.2 *Lead Planarity* — The lead tips as measured in the center of the back, uncoined surface of the lead tip shall be located within the following tolerances of the Z plane: Lead Planarity: ± 0.10 mm (0.004 in.).

6.1.8.3 *Die Attach Pad Planarity* — The die attach pad when measured at the center must be within the following tolerances of the Z plane: Pad Planarity: ± 0.075 mm/0.125 mm (0.003 in./–0.005 in.).

6.2 External Area and Strip

6.2.1 Material

6.2.1.1 0.20 mm (0.008 in.) material thickness recommended for 0.300 in. wide packages.

6.2.1.2 0.25 mm (0.010 in.) material thickness recommended for 0.300 in. wide packages.

6.2.1.3 Nominal thickness tolerances shall be ± 0.008 mm (0.0003 in.).

6.2.1.4 *Width Tolerance* — ± 0.051 mm (0.002 in.).

6.2.2 *Coil Set* — Maximum of 3.175 mm (0.125 in.) measured in a free standing state over strip length.

6.2.3 *Crossbow* — Shall not exceed the following dimensions: Maximum Crossbow ± 0.127 mm (0.005 in.).

6.2.4 *Camber* — Shall not exceed 0.05 mm (0.002 in.) over a gauge length of 150 mm (6.00 in.). (See SEMI G10.)

6.2.5 *Progression* — The progression over strip length shall be within ± 0.051 mm (0.002 in.) of nominal value.

6.2.6 *Burrs* — Burrs shall be firmly attached and able to withstand a probe force of 10 grams. Vertical burrs inside the dambar shall not exceed 0.02 mm (0.001 in.). Vertical burrs outside the dambar and horizontal burrs in any location shall not exceed 0.05 mm (0.002 in.).

6.2.7 Pits and Slug Marks

6.2.7.1 Within functional area and on external leads there shall be no slug marks. Pits shall not exceed 0.008 mm (0.0003 in.) in depth and 0.013 mm (0.0005 in.) in largest surface dimension in these areas.

6.2.7.2 *Areas Other than 6.2.7.1* — Pits and imperfections shall not affect leadframe strength regardless of size and shall not exceed 0.05 mm (0.002 in.) in depth and 0.07 mm (0.005 in.) in largest surface dimension.

6.2.8 *Strip Cutoff Location* — Strip cutoff shall be within ± 0.05 mm (0.002 in.) of basic strip length.

7 Test Methods

7.1 See SEMI G10 for Measurement Methods.

8 Sampling

8.1 Sampling will be determined between user and supplier.

9 Packaging and Marking

9.1 *Packaging* — Leadframes must be packed in containers designed and constructed to prevent damage and/or contamination. Specific protection must be provided against foreseeable mechanical and environmental hazards.