

SEMI G28-0997

SPECIFICATION FOR LEADFRAMES FOR PLASTIC MOLDED S.O. PACKAGES

1 Purpose

This specification defines the acceptance criteria for stamped leadframes for plastic molded S.O. packages.

2 Scope

This specification is a guideline for production of stamped S.O. Leadframes to be used in plastic molded S.O. packages.

3 Referenced Documents

3.1 SEMI Specifications

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

SEMI G9 — Specification for Stamped Leadframes for Plastic Molded Dual-In-Line Semiconductor Packages

SEMI G10 — Standard Method for Mechanical Measurement for Plastic Package Leadframes

SEMI G21 — Specification for Plating Integrated Circuit Leadframes

3.2 ANSI/ASQC Specifications¹

ANSI/ASQC Z1.4 — Sampling Procedures and Tables for Inspection by Attributes

3.3 ANSI Specifications²

ANSI Y14.5M — Dimensioning and Tolerancing

4 Terminology

4.1 *burr* — A fragment of excess material either horizontal or vertical adhering to the component surface.

4.2 *camber* — Curvature of the leadframe strip edge in the horizontal plane (see Figure 1).

4.3 *coil set* — Longitudinal bowing of the leadframe (see Figure 2).

4.4 *coined area* — That area at the tip of the bond fingers flattened to produce an acceptable surface for wire bonding (see Figure 3).

4.5 *crossbow* — Transverse bowing of the leadframe (see Figure 4).

4.6 *functional area* — The die attach pad and the wire bond (lead tips) area.

4.7 *lead twist* — Angular rotation of bonding fingers (see Figure 5).

4.8 *pit* — A shallow surface depression or crater in the leadframe material.

4.9 *slugmarks* — Random dents in the leadframe caused by foreign material in the stamping die.

4.10 *stamped leadframe terminology* — (See Figure 6.)

5 Ordering Information

Purchase orders for leadframes for plastic molded S.O. packages furnished to this specification shall include the following items:

- Current leadframe specification drawing.
- All dimensions and tolerances per ANSI Y14.5 practices.
- Material type and physical characteristics (see SEMI G4).
- Type hardness and thickness of any required plating (see SEMI G21).

6 Dimensions

See Table 1 and Figure 7 for standard dimensions. Tolerances shall be agreed between vendor and customer.

7 Defect Limits and Parameters (see SEMI G10 for measurement methods)

7.1 Internal Frame Area

7.1.1 *Minimum Flat Wire Bonding Area* — 80% of nominal lead width and .015" (.381 mm) in length.

7.1.2 Coin Depth

7.1.2.1 0.008" (0.20 mm) material: 0.0005" (0.013 mm) minimum/0.001" (0.02 mm) maximum.

7.1.2.2 0.010" (0.25 mm) material: 0.0005" (0.013 mm) minimum/0.002" (0.05 mm) maximum.

NOTE: Maximum coin depth may also be constrained by minimum lead spacing requirement given in Section 7.1.3.1. Minimum coin depth may also be constrained by minimum bond area requirement given in Section 7.1.1.

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² ANSI, 1430 Broadway, New York, NY 10018

7.1.3 X-Y Plane Lead Spacing and Location

7.1.3.1 Spacing between leads to be 0.004" (0.100 mm) minimum.

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

7.1.4 X-Y Plane Die Attach Pad Location — Die attach pad to be located within ± 0.002 " (0.051 mm) as measured from the centerline of the reference hole in the side rail.

7.1.5 Lead Twist — Shall not exceed $3^{\circ}30'$ or 0.0006" (0.015 mm) per 0.010" (0.254 mm) of lead width.

7.1.6 Die Attach Pad Tilt and Flatness

7.1.6.1 Tilt — 0.001" (0.025 mm) maximum per 0.100" (2.54 mm) in the undepressed state. 0.002" (0.015 mm) maximum per 0.100" (2.54 mm) in the depressed condition.

7.1.6.2 Flatness — To be within 0.002" (0.051 mm) T.I.R. per 0.100" (2.54 mm) when measured from the center to each of the four corners. The corners are defined at 0.005" (0.127 mm) from each edge.

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

7.1.8 Lead and Die Attach Pad Coplanarity

7.1.8.1 The coplanarity relationship is based on reference to the Z plane (see SEMI G10).

7.1.8.2 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: ± 0.004 "

7.1.8.3 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: $+ 0.003$ "/ -0.005 "

7.2 External Area and Strip

7.2.1 Material

7.2.1.1 0.008" (0.20 mm) material thickness recommended for 0.150" wide packages.

7.2.1.2 0.010" (0.25 mm) material thickness recommended for 0.300" wide packages.

7.2.1.3 Nominal Thickness — Tolerances shall be ± 0.0003 " (0.008 mm).

7.2.1.4 Width Tolerance — ± 0.002 " (0.051 mm).

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

7.2.3 Crossbow — Crossbow shall not exceed the following dimensions:

Maximum Crossbow: ± 0.005 " (0.127 mm)

7.2.4 Camber — Shall not exceed 0.002" (0.05 mm) over a gage length of 6.00" (150 mm). (See SEMI G10.)

7.2.5 Progression — Should be specified along with tolerances on the drawing.

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

7.2.7 Pits and Slugmarks

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

7.2.7.2 Areas Other than 7.2.7.1 — Pits and imperfections shall not affect leadframe strength regardless of size and shall not exceed 0.002" (0.05 mm) in depth and 0.005" (0.127 mm) in largest surface dimension.

7.2.8 Strip Length Cutoff — (See SEMI G10.)

7.2.8.1 Strip cutoff location and tolerance shall be detailed on the drawing.

7.2.8.2 Overall strip length and tolerance shall be detailed on the drawing.

8 Functional Testing

Functional testing shall be agreed upon between vendor and customer.

9 Sampling

Sampling based on ANSI/ASQC Z1.4 shall be agreed between supplier and purchaser.

10 Packaging, Marking, and Packing List

10.1 Packaging — The shipping containers and materials shall be suitably designed to provide the leadframes with protection against normal transportation damage risks which include crushing and

spillage, and exposure to moisture and other corrosive gases.

10.1.1 The inner packaging materials for cut strips must not cause particulate contamination on the leadframes and shall be clean room compatible as defined by the customer. The leadframes boxes shall be vacuum sealed in a bag with a desiccant. If the leadframes are to be delivered in coil form, the coil diameter shall be set in the purchase order (see SEMI G9).

10.2 *Marking*

10.2.1 *Internal Packages* — Each internal package shall be clearly marked with the following information, as appropriate:

- a. Customer's part number
- b. Customer's purchase order number
- c. Drawing number (customer's and/or vendor's, as requested by customer)
- d. Vendor's shipping lot number
- e. Quantity
- f. Date of Manufacture
- g. Any agreed upon certification data

10.2.2 *External Packages* — The packing list on the outside of the external package shall contain the following information:

- a. Customer's part number
- b. Customer's purchase order number
- c. Quantity
- d. Shipping Date
- e. Any specific instructions for receiving dock personnel

11 **Certification**

11.1 Upon request of the customer in the contract or purchase order, a vendor's certification that the product was manufactured and tested in accordance with this specification, together with a report of the test results shall be furnished at the time of shipment. However, if the customer does perform inspection and test on a certified shipment and the product fails to meet the requirements, the product shall be subject to rejection.

11.2 If the customer and vendor agree, the product may be certified as capable of meeting this specification. In this context, capable of meeting signifies that the vendor is not required to perform all the inspections and

tests. However, if the customer does perform inspection and test on a certified shipment and the product fails to meet the requirements, the product shall be subject to rejection.