

SEMI G44-86

LEAD FINISHES FOR GLASS TO METAL SEAL CERAMIC PACKAGES (ACTIVE DEVICES ONLY)

1 Purpose

1.1 This specification defines lead finishes for glass to metal seal ceramic packages assembled with iron-nickel alloy leadframe construction (e.g., Cer-DIP), Cer-pack, with glass to metal seals, or quad flat pack). This specification excludes leadless chip carriers, PGA, and other multi-layered ceramic/brazed alloy packages. It defines composition, properties, limits, and refers to appropriate tests for utility.

2 Applicable Documents

2.1 *Order of Precedence* — In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

2.2 *Referenced Documents* — Unless otherwise specified, the following standards and specifications, with appropriate revision letter at time of order entry, form a part of this specification to the extent and for the purpose specified herein.

2.3 ASTM Specifications¹

ASTM B487 — Measuring Metal and Oxide Coating Thickness by Microscopical Examination of a Cross Section

ASTM B545 — Standard Specification for Electro-Deposited Coatings of Tin

ASTM B567 — Measurement of Coating Thickness by the Beta Backscatter Principle

ASTM B568 — Measurement for Coating Thickness by X-Ray Spectrometry

ASTM B571 — Adhesion of Metallic Coatings

ASTM E384 — Standard Test Methods for Micro-hardness of Materials

2.3.1 Federal Specification²

QQ-S-571 — Solder, Tin Alloy; Tin-Lead Alloy; and Lead (Pb) Alloy

2.3.2 United States Military Specifications²

MIL-T-10727 — Tin Plating; Electrodeposits or Hot Dipped, for Ferrous and Non-Ferrous Metals

MIL-G-45204 — Gold Plating, Electrodeposited

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

MIL-M-38510 — Microcircuits, General Specification

2.4 SEMI Specifications

SEMI G2 — SEMI Specification Metallic Leadframes for CerDIP Packages

SEMI G35 — SEMI Specification: Test Methods for Lead Finishes on Semiconductor (Active Devices)

¹ ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, USA; Telephone: +1.610.832.9585, Fax: +1.610.832.9555, <http://www.astm.org>

² 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 Application

3.1 Table 1 lists recommended finishes for devices employing iron nickel alloy leadframes. This table and this specification apply only to leadframe materials which conform to composition limits specified in MIL-M-38510 as lead material Type A or Type B.

3.1.1 Gold plate is useable in socketed application as well as in soldered application. Hardness, grain size, and other properties shall be specified in the procurement drawing.

3.1.2 Solder, as used in this specification, refers to Tin Lead (Pb) as 63/37 or 60/40, unless otherwise specified and agreed upon between user and supplier and stated on procurement drawings.

3.1.3 "Tinning" is a generic term (primarily used in user industries) and means hot solder dip (near 60/40 Tin Lead (Pb)) and not an application of tin.

3.2 Composition, limits, mechanical and physical properties, dimensions and tolerances for CerDIP leadframes are as stated in SEMI Specification G2.

3.3 Lead finishes details are stated in Paragraph 4.

3.4 Tests for the lead finishes shall be in accordance with SEMI Specification G35.

3.5 With the exception of gold and hot solder dip, any of the lead finishes described in Paragraph 4 may be reflowed, that is, raised above their melting pot.

4 Lead Finish

4.1 Tin Electroplate

4.1.1 *Composition* — The tin deposit shall not be less than 99.8% pure tin and shall not contain more than 0.05% pure carbon. The deposit is Type 1 as defined in MIL-T-10727.

4.1.2 *Characteristics* — The procedure used for evaluating the tin coating and the general requirements for the coating shall comply with ASTM B545 or the latest current revision, except where noted below.

4.1.2.1 *Thickness* — The plated coating as measured on the major flat of the leads shall be a minimum of 300 microinches (7.5 micrometers).

4.1.2.2 *Appearance* — Surface appearance shall be smooth, fine grained, adherent and free from exposed basis metal or underplate, visible blisters, pits, nodules, porosity, indications of burning, excessive edge buildup and other detrimental defects.

4.1.2.3 *Hardness* — None specified.

4.1.2.4 *Preservation* — Preservation coating, if desired and agreed upon by user and supplier, is acceptable. (Example: Stearic acid solution in xylol as defined in MIL-T-10727.)

4.2 Tin Lead (SnPb) Electroplate

4.2.1 *Composition* — Major constituents shall be tin and lead (Pb) with minor impurities. Range of major constituents shall be:

NOTE — Users should be advised that many plating solutions containing lead (Pb) also contain acid fluorides. Such solutions will attack those glass materials commonly used in ceramic packages. Adequate process controls must be developed and used in conjunction with this plating process to ensure package and device integrity.

4.2.2 *Purity and Application* — Per MIL-M-38510.

4.2.3 *Thickness* — Shall be a minimum of 7.5 micrometers (300 microinches) as measured on the major flat of the leads.

4.2.4 *Appearance* — Surface appearance shall be smooth, fine-grained, adherent, and free from exposed basis metal or underplate, visible blisters, pits, nodules, porosity, indications of burning, excessive edge buildup and other detrimental defects.

4.2.5 *Hardness* — None specified.