

SEMI G64-96 (Reapproved 1104) SPECIFICATION FOR FULL-PLATED INTEGRATED CIRCUIT LEADFRAMES (Au, Ag, Cu, Ni, Pd/Ni, Pd)

This specification was technically reapproved by the Global Assembly & Packaging Committee and is the direct responsibility of the Japanese Packaging Committee. Current edition approved by the Japanese Regional Standards Committee on July 23, 2004. Initially available at www.semi.org September 2004; to be published November 2004. Originally published in 1996.

1 Purpose

1.1 This specification is intended as a guideline for evaluating plating layer characteristics required by users of full-plated leadframes for plastic semiconductor packages.

1.2 *Background* — Full-plated leadframes have received attention in recent years as a possible solution to challenges and restrictions resulting from the effects of Pb on the environment, package reliability improvement due to the P.P.F. process, lead coplanarity on fine-pitched leadframes, and lead bridges with solder plating.

2 Scope

2.1 The specification and test procedures detailed in this document apply to full-plated leadframes.

2.2 *Units* — SI units are used in this document.

NOTICE: This standard does not purport to address safety issues, if any, associated with its use. It is the responsibility of the users of this standard to establish appropriate safety and health practices and determine the applicability of regulatory or other limitations prior to use.

3 Referenced Standards

3.1 SEMI Standards

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

SEMI G18 — Specification Integrated Circuit Leadframe Material Used in the Production of Etched Leadframes

SEMI G21 — Specification for Plating Integrated Circuit Leadframes

SEMI G52 — Standard Test Method for Measurement of Ionic Contamination on Semiconductor Leadframes (Proposed)

SEMI G55 — Test Method for Measurement of Silver Plating Brightness

SEMI G56 — Test Method for Measurement of Silver Plating Thickness

3.2 ISO Standards¹

ISO-3497 — Metallic Coating Measurement of Coating Thicknesses, X-Ray Spectrometer Method

ISO-9227 — Corrosion Tests in Artificial Atmospheres - Salt Spray Tests

3.3 JIS Standard²

JIS-C-0053 — Solderability Testing by the Wetting Balance Method

3.4 Military and Federal Standards³

MIL-C-14550 — Copper Plating-Electrodeposited

MIL-F-14256 — Flux, Soldering, Liquid, Paste Flux, Solder Paste, and Solder Paste Flux

MIL-G-45204 — Gold Plating-Electrodeposited

MIL-STD-883D — Method 2003.7, Solderability

QQ-N-290 — Nickel Plating-Electrodeposited

QQ-S-365 — General Requirements for Electrodeposited Silver Plating

QQ-S-571 — Solder Composition

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

4 Terminology

4.1 Definitions

4.1.1 *finish plating* — final plating layer whose electrodeposits fulfill the main purpose of the required characteristic.

1 International Organization for Standardization, ISO Central Secretariat, 1, rue de Varembe, Case postale 56, CH-1211 Geneva 20, Switzerland. Telephone: 41.22.749.01.11; Fax: 41.22.733.34.30, Website: www.iso.ch

2 Japanese Industrial Standards, Available through the Japanese Standards Association, 1-24, Akasaka 4-Chome, Minato-ku, Tokyo 107-8440, Japan. Telephone: 81.3.3583.8005; Fax: 81.3.3586.2014, Website: www.jsa.or.jp

3 United States Military Standards, Available through the Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120-5099, USA. Telephone: 215.697.3321

4.1.2 *solderability* — an index of the wettability and coverage with solder of lead surface.

4.1.3 *underplating* — plating layers that complete the required characteristics of the final plating layer and lies between the base material and final plating layer.

5 Ordering Information

5.1 Priority

5.1.1 To avoid confusion, the order of precedence when ordering leadframes shall be as follows:

1. Purchase Order (agreed between user and supplier)
2. This Specification
3. Referenced Documents

6 Materials

6.1 *Base Material* — Cu alloys or Fe/Ni alloys.

6.2 *Plating Material* — Underplating and Finish plating are shown in Table 1.

Table 1 Table 1 Underplating and Finish Plating

Finish Plating	Underplating	Base Material	
		Cu-Alloys	Fe, Ni-Alloys
Au (MIL-G-45204)	-	N/A	X
	Ni	X	X
Ag (QQS-365)	-	X	N/A
	Cu	X	X
Cu (MIL-C-14550)	-	X	X
	Ni	X	X
Ni (QQN-290)	-	X	X
	Cu	X	X
Pd/Ni-Alloy	-	X	X
	Ni	X	X
	Cu	X	X
Pd	-	X	X
	Ni	X	X
	Cu	X	X
	Pd/Ni-Alloy	X	X

7 Plating Specification

7.1 *Plating Thickness* — For full-plated leadframes, the designed thickness including under plating is restricted as follows to limit the effects of thickness variation on coplanarity and outer lead width.

- Designed thickness including under plating-1 / Ag-plating: 5 µm MAX

- Designed thickness including under plating-2 / Au, Cu, Ni, Pd/Ni-Alloy, Pd plating: 2 µm MAX

7.2 *Visual Inspection* — Rejectable conditions are as follows:

1. Any bare spots, or missing plating in critical area as defined the coined areas or minimum flat wire bond area in the appropriate leadframe specification.
2. Any peeling or blistered plating.
3. Any nodules in critical area as defined the coined areas or minimum flat wire bond area in the appropriate leadframe specification.

NOTE 1: Nodules not exceeding 0.0381 mm in a surface dimension and 0.0127 mm in height, in non-critical areas are allowed providing there are no more than one per internal lead finger or six (6) per leadframe.

4. Any pits which exceed 0.008 mm in depth or 0.0127 mm in a surface dimension in critical areas or 0.0254 mm in depth or 0.051 mm in a surface dimension in non-critical areas.
5. Any scratches or scrapes in the metallization plating which expose underplating or base material.
6. Any scratches or scrapes in critical area which cause a build up of material in excess of 0.0127 mm in height.
7. Any foreign material, contamination, or tarnish.
8. Non-uniformity or rough-plated surface.

7.3 *Visual Inspection after Baking* — The test procedure is described in Section 9.3. Visual inspection after baking shall be performed according to the procedure in Section 9.2.1.

7.4 *Corrosion Resistance (not applicable to Cu plating)* — In the test result, allowable corrosion specification shall be agreed upon between user and supplier.

7.5 *Surface Ion Contamination* — Allowable ion species and ion concentration shall be agreed upon between user and supplier.

7.6 *Adhesion* — If there is any plating film on the test tape, the component shall be rejected. Adhesive test should be performed according to the procedure in Section 9.6.

7.7 Functional Tests

7.7.1 *Die Attach* — Agreed upon between user and supplier.