

SEMI G62-95 (Reapproved 0302)

TEST METHOD FOR SILVER PLATING QUALITY

This test method was technically approved by the Global Physical Interfaces and Carriers Committee and is the direct responsibility of the Japanese Physical Interfaces and Carriers Committee. Current edition approved by the Japanese Regional Standard Committee on November 26, 2001. Initially available at www.semi.org December 2001; to be published March 2002. Originally published in 1995.

1 Purpose

1.1 This test method describes procedures to determine silver plating quality.

2 Scope

2.1 These methods apply to silver plating on leadframes for plastic packages. Applicable plating styles are listed in Table 1.

Table 1 Plating Style

Plating Style	Description
Overall Plating	Plating covers the whole leadframe area. In some situations, the leadframe may be quoted as having overall plating, but the rails will be unplated in order to save plating costs.
Ring Plating	Only inner leads plated on top surface.
Ring-Tip Plating	Only wire bonding areas of inner leads plated.
Spot Plating	Only die pad and inner leads plated on top surface.
Spot Plating (both sides)	Die pad and inner leads are plated on both the top and bottom surfaces of the leadframe.
Tip Plating	Only die pad and wire bonding areas plated.
W-Ring Plating	Only inner leads plated on top surface and around die pad.

2.2 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 health practices and determine the applicability or regulatory limitations prior to use.

3 Units

3.1 This test method uses SI units.

4 Referenced Standards

4.1 SEMI Documents

SEMI G55 — Test Method for Measurement of Silver Plating Brightness

SEMI G56 — Test Method for Measurement of Silver Plating Thickness

4.2 Military Specifications¹

MIL-M-38510 — General Specification for Microcircuits

5 Terminology

5.1 *area variation* — The variation between the defined and actual plated area.

NOTE 1: Oversized plating area is an area larger than the specified area. Undersized plating area is an area smaller than the specified area.

5.2 *attached silver particles* — Small silver particles which are attached to the normal plated surface during the plating process.

5.3 *bleed out, back side* — Plating on the back of leadframe caused by seepage of the plating solution beyond the mask.

5.4 *bleed out, side* — Plating occurring on the sides of leadframe features.

5.5 *bleed out, surface* — Seepage of the plating solution beyond the mask on the top surface of the leadframe increasing the plated area.

5.6 *bleed out, epoxy* — The separation of the resin component from the filled epoxy resin such that it creeps on the die pad beyond the outline of resin fillet.

5.7 *blister (metal)* — An enclosed, localized separation of the plating metallization from the base material or from another layer of plating which can be depressed with a sharp instrument.

NOTE 2: This may occur during plating or after application of heat.

5.8 *burnt deposit* — Plated surface is too rough.

5.9 *contamination* — Three-dimensional alien material adhering to a surface.

5.10 *corrosion* — Electrochemical degradation of the material usually exhibited by discoloration such as rust.

¹ Available through the Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120-5099, USA. Telephone: 215.697.3321

5.11 *discoloration* — Any change in the color of the metallization, as detected by the naked eye. This may occur on as plated or after application of heat.

5.12 *excessive plating* — Plating exists outside the specified area.

5.13 *foreign material* — An adherent particle other than parent material of the component.

NOTE 3: Adherent denotes inability to be removed with an air or nitrogen blow-off at 20 psi.

5.14 *incomplete plating* — Plating is missing from any part of the designated area.

5.15 *leadframe top surface* — The active side of the leadframe, the surface used for die attach and wire bonding.

5.16 *nodule (of plated particle)* — A protrusion or lump of plating material above the plated surface.

5.17 *plating nonuniformity* — The lack of consistency of brightness of silver as plated, or after the application of heat. These changes in the plated grain structure causes the inconsistency.

5.18 *peeling* — The lifting of metallization from a surface.

5.19 *pit (of plating)* — A hole or depression extending below the surface of the plating.

5.20 *scratch (on plating)* — A surface deformation which exposes underlying metallization.

5.21 *spot-sparing* — A stain-like discoloration occurring after the application of heat.

5.22 *step plating* — Plateau-like plating having more than one level.

5.23 *spot plating misalignment* — The variation between the defined and actual center lines of the plated area.

5.24 *tape test* — A metallization layer adhesion test technique using adhesive tape to apply a peel force to the layer. This test may be applied on plated material or after the application of heat.

5.25 *whisker* — A plating metal burr-like filament attached to the surface of the plating.

6 Summary of Method

6.1 Various test methods are described or referenced to determine silver plating quality for the following items:

- Plating Area
- Plating Thickness
- Plating Brightness

- Visual Inspection
- Functional Test

7 Interferences

7.1 Avoid contaminating the silver plated surface prior to performing the test. Such contamination may affect visual appearance and die attach, wire bonding, and solderability functional tests.

8 Equipment

8.1 GAM densitometer or equivalent

8.2 X-Ray Fluorescence

8.3 Microscope with a 40× maximum magnification.

8.4 Heater block, hot plate or oven (furnace)

9 Sampling

9.1 Sampling plans shall be agreed between user and supplier.

10 Test Sequence

10.1 When the test methods are used at incoming inspection, the sequence of tests shall be as follows:

10.1.1 *Plating Area* — See Section 11.1.

10.1.2 *Plating Thickness* — See Section 11.2.

10.1.3 *Plating Brightness* — See Section 11.3.

10.1.4 *Visual Inspection* — See Section 11.4.

10.1.5 *Heat Test* — See Section 11.5.

10.1.6 *Functional Test* — See Section 11.6.

11 Test Procedures

11.1 *Plating Area*

11.1.1 Measurements may be made by using a glass scale, shadow scope, or microscope.

11.1.2 Measurement items are listed below:

11.1.2.1 Area variation

11.1.2.2 Spot plating misalignment

11.2 *Plating Thickness*

11.2.1 Plating thickness shall be measured at a point on the inner lead or the center point of the die pad.

NOTE 4: The location of the thickness test shall be agreed between user and supplier.

11.2.2 Thickness measurements may be made using X-Ray Fluorescence per SEMI G56.

11.3 *Plating Brightness*