

# SEMI G8-94

## TEST METHOD FOR GOLD PLATING

### 1 Preface

1.1 *Purpose* — This test method describes procedures to determine gold plating quality.

1.2 *Scope* — These methods apply to gold plating on cofired ceramic or metal packages. The grade, hardness, and thickness of the gold plating shall be specified per MIL-G-45204 unless otherwise agreed between vendor and customer.

NOTE 1: The gold plate may be over refractory metal on cofired ceramic packages or over an underplate on metal packages.

### 2 Applicable Documents

#### 2.1 *Referenced Documents*

2.1.1 *SEMI Specifications* — All SEMI package specifications

2.1.2 *ASTM Specifications*<sup>1</sup>

ASTM B384 — Standard Test Method for Microhardness of Materials

ASTM B487 — Test Method for Measurement of Metal and Oxide Coating Thicknesses by Microscopic Examination of a Cross-Section

ASTM B567 — Method for Measurement of Coating Thickness by the Beta Backscatter Method

ASTM B568 — Method for Measuring Coating Thickness by X-Ray Spectrometry

ASTM F1269 — Test Methods for Destructive Shear Testing of Ball Bonds

2.1.3 *Military and Federal Specifications*<sup>2</sup>

MIL-STD-750 — Test Methods for Semiconductor Devices

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

MIL-G-45204 — Gold Plating, Electrodeposited

#### 2.2 *Related Documents*

##### *Military and Federal Specifications*

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

MIL-STD-202 — Test Methods for Electronic and Electrical Component Parts

MIL-STD-19500 — General Specification for Semiconductor Devices

MIL-M-38510 — General Specification for Microcircuits

### 3 Summary of Method

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

Visual Appearance

Plating Thickness

Plating Adhesion

<sup>1</sup> ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, USA; Telephone: 610.832.9585, Fax: 610.832.9555, <http://www.astm.org>

<sup>2</sup> United States Military Standards, Available through the Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120-5099, USA; Telephone: 215.697.3321.

Functional tests  
Salt Atmosphere  
Hardness

#### 4 Significance and Use

4.1 *Significance* — Poorly plated components result in lowered yields during package assembly operations or to reliability problems.

4.2 *Use* — The methods described in this document may be used by vendors to test gold plated components as part of their process control program, or by customers at incoming inspections.

The methods are to be used in conjunction with individual component specifications.

#### 5 Terminology

5.1 *blister (metal)* — An enclosed, localized separation of a metallization layer from its base material (such as ceramic or another metal layer) that does not expose the underlying layer.

5.2 *discoloration* — The change in color of any plated metallization, gold, silver, aluminum, etc., as detected by the unaided eye after the application of heat to the metallization. The metallization may be over base metal, another plated layer, or on refractory metal.

5.3 *peeling (flaking)* — Any separation of the plated, vacuum deposited or clad metal from the base metal of a leadframe, lead, pin, heatsink, or seal ring, from an underplate, or from refractory metal on a ceramic package. Peeling exposes the underlying material. Also called flaking.

5.4 *pitting (plated metal layer)* — Unspecified depressions in the plated layer, not the underlying layer(s). Such pits may be caused by incorrect plating conditions.

5.5 *resin bleed-out (die attach)* — The surface creep of a resin used for die attach beyond the outer perimeter of the bulk of the resin (filler). For a given resin formulation, the resin creep may be exacerbated by the microstructure and cleanliness of the die attach surface.

5.6 *scratch* — An abrasion in the surface of a metallization layer which exposes the base material.

#### 6 Interferences

6.1 Avoid contaminating the gold plated surface (e.g., with finger oils), prior to performing the tests. Such contamination may effect visual appearance, and die attach, wire bond, and solderability functional tests.

#### 7 Equipment

7.1 Beta Backscatter system

7.2 Die Attach equipment

7.3 Eutectic Die Attach heater block or lot plate capable of  $450^{\circ}\text{C} \pm 10^{\circ}\text{C}$ .

7.4 Microscope 10–30× magnification with vertical lighting.

7.5 Micro Cross-Section equipment

7.6 Wire Bond equipment

7.7 X-Ray Fluorescence System

#### 8 Sampling

8.1 Sampling plans shall be agreed between vendor and customer.

#### 9 Test Sequence

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

9.1 *Visual Appearance* — See Section 10.1.