

SEMI G99-1122

SPECIFICATION FOR FLOWABILITY OF ENCAPSULATION MATERIALS FOR WAFER LEVEL PACKAGING AND PANEL LEVEL PACKAGING

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1 Purpose

1.1 Mold resin material characteristics are specified for legacy packages such as leaded and ball grid array packages, but there is no specification for encapsulation characteristics for wafer level packaging (WLP) and panel level packaging (PLP). Three different types of encapsulations such as liquid, granular, and sheet material are used for WLP and PLP and these requires the different characteristics and performances.

1.2 The characteristics of encapsulation materials such as flowability needs to be recognized and defined to enable the qualified encapsulation processes for large panel size.

2 Scope

2.1 This Specification focuses on the flowability of encapsulation material used in the manufacturing of WLP and PLP processes.

2.2 Two methodologies are defined to measure the flowability by either using a Spiral Flow or a Disk Compression technique.

2.2.1 Spiral Flow can be applied to granular type of encapsulation material.

2.2.2 Disk Compression can be applied to all three types of encapsulation materials.

NOTICE: SEMI Standards and Safety Guidelines do not purport to address all safety issues associated with their use. It is the responsibility of the users of the Documents to establish appropriate safety and health practices, and determine the applicability of regulatory or other limitations prior to use.

3 Limitations

3.1 This Specification applies to encapsulation materials of granule, sheet, and liquid type for WLP and PLP processes.

3.2 This Specification does not describe the use for leadframe based packaging processes.

4 Referenced Standards and Documents

4.1 SEMI Standards and Safety Guidelines

SEMI G83 — Specification for Bar Code Marking of Product Packages

4.2 ASTM® Standards¹

ASTM D3123 — Standard Test Methods for Flowability of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

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

5 Terminology

5.1 Abbreviations and Acronyms

5.1.1 PLP — panel level packaging

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>. ASTM trademark is owned by ASTM International.

5.1.2 *WLP* — wafer level packaging

5.2 Definitions

5.2.1 *cull* — a hardened resin pool that remains in the resin injection port when powdered mold resin is molded by a molding machine.

5.2.2 *molding die* — typically a metal mold for forming encapsulation materials by heating and pressure within a molding machine.

5.2.3 *spiral flow* — a characteristic value (length) of a method for measuring flowability when pressure is applied during heating and melting of a mold resin.

6 Test Methods

6.1 Measurements shall be made or certifiable to one of the SEMI or ASTM standard test methods and specified in the purchase order.

6.2 If several different standard test methods for an item are commonly used within a region, it is particularly important that the applicable method of test be identified in the purchase order.

6.3 If no method of test is specified in the purchase order and if standard test methods from different geographic regions are available, the default method shall be a method in common usage for the region of the purchaser of the panel.

6.4 If no standard test method for an item is available, the test procedure to be used must be agreed upon between supplier and customer.

7 Ordering Information

7.1 Purchase orders for encapsulant materials to this Specification shall include the properties below by the measurement of below defined methods.

7.2 In addition, the purchase order must indicate the test method to be used in evaluating each of those items for which alternate test procedures exist.

7.3 The following items must also be included in the purchase order:

7.3.1 Lot acceptance procedures,

7.3.2 Certification (if required),

7.3.3 Packing and shipping container labeling requirements.

8 Requirements

8.1 Encapsulation material purchased to this Specification shall be measured by Spiral Flow test method and Disk Compression test method.

8.2 *Spiral Flow Test Method*

8.2.1 *Measurement Principle*

8.2.1.1 Measure the length of flow of thermosetting resin with respect to mold temperature and molding machine plunger injection pressure.

8.2.1.2 Use the testing fixture with a resin injection port in the center and a spiral groove of Archimedes spiral with a constant groove spacing starting from that port. Figure 1 shows the schematic diagram of spiral flow measurement.