SEMI G45-93
RECOMMENDED PRACTICE FOR FLASH CHARACTERISTICS OF THERMOSETTING MOLDING COMPOUNDS

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1 Scope

1.1 This method describes a procedure for measuring the flashing characteristics of semiconductor grade transfer molding compounds.

2 Significance

2.1 The flashing tendency for semiconductor grade molding compounds depends on the interaction of several variables, including mold conditions, process parameters, molding compound viscosity, and curing characteristics. This test is not a valid method for predicting the flashing performance in all mold types. It is a method for comparing flash tendency and flashing type of different molding compounds when evaluated under a specific set of molding process parameters.

2.2 Flashing presents problems with subsequent processing of plastic packaged devices after molding. A high flashing tendency increases die wear in the trim and form operation, may interfere with plating or solder dip finishing operations, and may prevent good contact for electrical test. Thus, reduced tendency toward flashing will improve the plastic package subassembly operations. The information from this test will be of value in rating flash performance of any given compound to that in production use.

3 Apparatus

3.1 Transfer molding press with a platen area sufficient to maintain a uniform mold temperature and having (1) a transfer piston pressure potential of 1000 psi on the material; (2) sufficient clamping pressure to prevent flashing of the molding compound at clamping lands; and (3) a minimum plunger speed of 25.4 mm (1 in.) per second without load. The pot diameter shall be 31.75 to 44.45 ± 0.735 mm (1.250 to 1.750 ± 0.025 in.) and the clearance between pot and ram shall be sufficiently small that flashing does not occur above the first sealing groove on the ram.

3.2 *Standard Flash Test Mold* — Per Figure 1.

3.3 *Force Gauge* — With appropriate range to calibrate transfer pressure to minimum of 10.343 mpa (1,500 psi).

3.4 *Steel Rule* — Measured in 0.25 mm (0.010 in.).

3.5 *Halo Lamp* — 3× magnification, minimum.

3.6 *Thermocouple and/or Pyrometer Calibrated* — In the 160°C to 190°C range (calibration to be checked every 6 months).

4 Test Conditions

4.1 *Molding Compounds* — Refrigerated shipment and storage of some molding compounds is necessary. The molding compound is to be at room temperature before the container is opened. Care must be taken to preserve the original moisture content. The material should be in powdered form, unless otherwise specified.

4.2 *Flash Test Mold* — Shall be clean and free from any mold release agents or lubricants. A standard mold cleaning compound can be used to insure mold cleanliness.

4.3 *Molding Conditions*

4.3.1 The temperature of the mold shall be measured using a thermocouple inserted in the mold or with a surface pyrometer. The ram shall be kept at the mold temperature. Molding temperature is to be 175°C unless otherwise specified. Temperature must be maintained within ±3°C (±5°F) of the specified temperature.

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4.3.2 The transfer pressure for test, as measured under the transfer plunger, is to be 6.895 ± 0.177 mpa (1000 ± 25 psi) unless otherwise specified.

4.3.3 The weight of the charge shall be adjusted to give a molded cull thickness of 3.303 ± 0.254 mm (0.130 ± 0.010 in.) excluding vertical flash.

4.3.4 The free running ram speed shall be at least 25.4 mm/sec (1 in./sec). Recommended speed is 100 ± 25 mm/sec into the pot and application of pressure on the charge shall be maintained throughout the mold cycle.

4.3.5 Unless otherwise specified, a minimum of 1.5 minutes close and cure time shall be used.

4.3.6 Flash length shall be measured in 0.25 mm (0.010 in.) intervals.

5 Procedure

5.1 Thoroughly clean the ram, pot, and mold of any cured compound, or other foreign matter.

5.2 Heat the mold and ram to within ±3°C of the specified temperature.

5.3 At the beginning of each series of tests and at each change of compound, check and set the transfer pressure using the force gauge. The proper force gauge setting can be determined from the formula:

$$F = \frac{\Pi D^2 P}{4}$$

where F is the force in pounds, P is the desired pressure on the material in psi, and D is the ram diameter in inches.

5.4 For each material change, make at least three clean out runs using the material to be tested before recording data. These runs may be used to determine the charge weight.

5.5 Weigh out the compound to the nearest 0.1 g as previously determined to yield a cull of 3.302 ± 0.254 mm (0.130 ± 0.010 in.).

5.6 Raise the ram, add the compound to the pot, and immediately activate the transfer cycle.

5.7 Remove cull and measure thickness. If the cull is not within 0.130 ± 0.010 in., discard the run and repeat the test, adjusting the charge weight as necessary.

5.8 Open mold and measure longest flash for each channel to nearest 0.25 mm (0.010 in.) using 3× minimum magnification. Be sure to check both top and bottom plates of mold before measuring flash.

NOTE 1: Care must be taken to include the measurement of transparent and semi-transparent flash which may be present in the smaller channel. After measurements, diligence is required to remove all flash, including the transparent and semi-transparent varieties prior to the next test.

5.9 Repeat Steps 5.6 through 5.8 at least 3 times for repeatability.

6 Reporting of Results

6.1 Report the material designation and lot number.

6.2 Report the average and standard deviation of the flash length in each channel.

6.3 Report the temperature and pressure used for the tests.

NOTE 2: Common Errors/Problems:

- Inadequate preheat of flash mold and/or transfer plunger prior to test and between shots.
- Incorrect cull thickness.
- Omission of transparent or semi-transparent flash in measurement (often present in smallest two channels).
- Inadequate cleaning of mold between shots.
- Starting from the end of the ruler to make flash length measurements instead of starting at a known distance from the end.
- Inadequate mold break-in. Three shots should be run and disregarded before recording flash measurements for each material.

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