

## **20 LPI MS RESIN passed the 94 HB in UL Standard as shown below:**



### **UL 94 flammability testing**

There are two types of pre-selection test programs conducted on plastic materials to measure flammability characteristics. The first determines the material's tendency either to extinguish or to spread the flame once the specimen has been ignited. The first program is described in UL 94, The Standard for Flammability of Plastic Materials for Parts in Devices and Appliances, which is now harmonized with IEC 60707, 60695-11-10 and 60695-11-20 and ISO 9772 and 9773.

The second test program measures the ignition resistance of the plastic to electrical ignition sources. The material's resistance to ignition and surface tracking characteristics is described in UL 746A, which is similar to the test procedures described in IEC 60112, 60695 and 60950.

### **UL 94 flame classifications**

There are 12 flame classifications specified in UL 94 that are assigned to materials based on the results of these small-scale flame tests. These classifications, listed below in descending order of flammability, are used to distinguish a material's burning characteristics after test specimens have been exposed to a specified test flame under controlled laboratory conditions.

- Six of the classifications relate to materials commonly used in manufacturing enclosures, structural parts and insulators found in consumer electronic products (5VA, 5VB, V-0, V-1, V-2, HB).
- Three of the remaining six classifications relate to low-density foam materials commonly used in fabricating speaker grills and sound-deadening material (HF-1, HF-2, HBF).
- The last three classifications are assigned to very thin films, generally not capable of supporting themselves in a horizontal position (VTM-0, VTM-1, VTM-2). These are usually assigned to substrates on flexible printed circuit boards.

### **Horizontal versus vertical positioning**

Specimens molded from the plastic material are oriented in either a horizontal or vertical position, depending on the specifications of the relevant test method, and are subjected to a defined flame ignition source for a specified period of time. In some tests, the test flame is only applied once, as is the case of the horizontal burning (HB) test, while in other tests the flame is applied twice or more.

A HB flame rating indicates that the material was tested in a horizontal position and found to burn at a rate less than a specified maximum.

# Tests for Flammability of Plastic Materials for Parts in Devices and Appliances

## UL 94

### 1 Scope

1.1 These requirements cover tests for flammability of polymeric materials used for parts in devices and appliances. They are intended to serve as a preliminary indication of their acceptability with respect to flammability for a particular application.

1.1 revised June 2, 2006

1.2 The methods described in this Standard involve standard size specimens and are intended to be used solely to measure and describe the flammability properties of materials, used in devices and appliances, in response to a small open flame or radiant heat source under controlled laboratory conditions.

1.2 revised June 2, 2006

1.2.1 The tests in the Standard for Tests for Flammability of Small Polymeric Component Materials should be used to evaluate small components which contain materials that can not be fabricated into standardized specimens in the minimum use thickness and subjected to applicable preselection tests in UL 94. Test procedures in UL 1694 are applicable to small components with an overall volume of less than 2500 mm<sup>3</sup> (0.15 in<sup>3</sup>). UL 1694 is generally not applicable to small components with an overall volume greater than 2500 mm<sup>3</sup> (0.15 in<sup>3</sup>).

1.2.1 added June 2, 2006

1.3 The final acceptance of the material is dependent upon its use in complete equipment that conforms with the standards applicable to such equipment. The flammability classification required of a material is dependent upon the equipment or device involved and the particular use of the material. The performance level of a material determined by these methods shall not be assumed to correlate with its performance in end-use application. The actual response to heat and flame of materials depends upon the size and form, and also on the end-use of the product using the material. Assessment of other important characteristics in the end-use application includes, but is not limited to, factors such as ease of ignition, burning rate, flame spread, fuel contribution, intensity of burning, and products of combustion.

1.3 revised June 2, 2006

1.4 If found to be appropriate, the requirements are applied to other nonmetallic materials.

1.4 revised June 10, 1997

1.5 These tests, with the exception of the Radiant Panel Test in Section 10, are not applicable to the evaluation of parts where the thickness exceeds 13.0 mm or where the surface area exceeds 1 m<sup>2</sup>. These requirements do not cover polymeric materials when used for building construction, finishing, or contents such as wall and floor coverings, furnishings, decorative objects and so forth. In addition, the fire resistance (in terms of an hourly rating), flame spread, smoke characterization, and heat release rate is not evaluated. Other fire tests exist and shall be used to evaluate the flammability of materials in the intended end-use-product configuration.

1.5 revised June 2, 2006

1.6 Deleted June 2, 2006