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IPC-TM-650
TEST METHODS MANUAL

Number	
2.5.10.1	
Subject	
Insulation Resistivity for Adhesive Interconnection Bonds	
Date	Revision
11/98	
Originating Task Group	
SMT Mounting Adhesives Task Group (5-24d)	

1 Scope The purpose of this test method is to quickly assess the adequacy of a given Anisotropically Conductive Adhesive Film (ACF) construction and bonding process for avoiding short circuits between adjacent traces of a flex circuit being bonded to a low profile circuit substrate.

1.1 Purpose ACF materials are often used to interconnect fine-pitch flexible circuitry to substrates such as flat-panel displays. A center to center pitch range of 80 µm to 200 µm is not uncommon in circuits for flat panel display applications. It is critical that the particle dispersion within the ACF be of sufficient quality such that there is no inherent tendency for short circuits between adjacent traces. In addition, it is important that a bonding process is used, which doesn't create any undue accumulation of particles, which will lead to short circuits.

2 Applicable Documents None

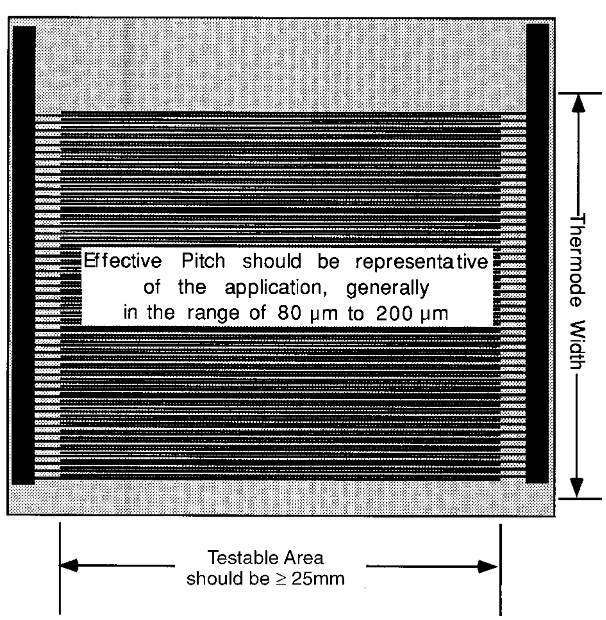

Figure 1 Suggested Flex Circuit Layout for Insulation Resistance Test

3 Test Specimens

3.1 In order to perform this test, a custom-designed and fabricated flex circuit substrate will need to be produced.

A suggested flex circuit construction of a design is shown in Figure 1. Flex circuit materials should be selected to be representative of what is being used in the application. The traces alternate between anodic and cathodic polarity as shown. Trace thickness, width, and pitch, should be selected in accordance with the application. Total trace count should be at least 100, and total width of the pattern should be slightly less than the thermode length. Total length of the traces should be sufficient to allow at least four bonds to be accommodated as shown in Figure 2 and Figure 3.

N is the number of circuit traces (at least 100).

I is the measured leakage current in amps after 10 seconds @ 50V.

g is the gap spacing between adjacent traces on the circuit in mm (of the order 0.04 mm to 0.1 mm).

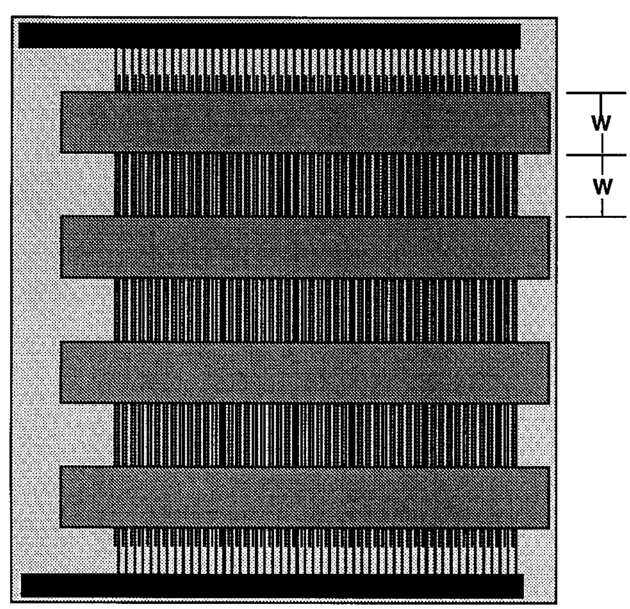

Figure 2 Preattachment of the ACF Strips to the Flex Circuit

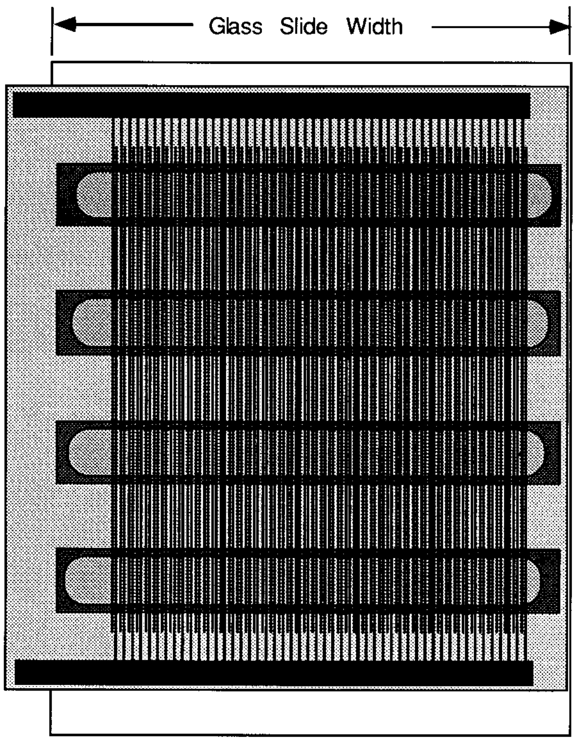

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Figure 3 Flex Circuit Containing Four ACF Bond Sites, After Being Bonded to a Glass Slide

4 Apparatus

4.1 DC power supply capable of providing voltage in the range of 10 V to 100 V, with an accuracy of at least ± 10%, and capable of supplying current in the range of 0 mA to 1 mA at those voltage levels

4.2 DC ammeter capable of measuring current in the range of 0 to 1 mA, with an accuracy of ± 0.001 mA

4.3 Stopwatch or other timing mechanism capable of resolving ± 1 second

4.4 Hot-bar bonds capable of producing ACF bonds between flex circuits and flat panel displays, and outfitted with a thermode of appropriate length and width for a given application (Thermode width is generally in the range of 2 mm to 3 mm, and length is in the range of 25 mm to 50 mm.)

5 Procedure

5.1 Calculate the insulation resistivity (*pi*) in Ohm-cm for each of three samples. Each sample must meet the specification requirement (see Figure 4).

$$pi = \frac{(A)(B)(C)(D)(E)}{(F)(G)(H)} = \Omega - \text{cm}$$

where:

A = voltage

B = number of bonds

C = width of bond (mm)

D = conductor thickness (mm)

E = total number of lines - 1

F = mm to µm conversion

G = current amps

H = trace to trace gap (mm)

Example A test circuit is designed with 100 total circuit traces (50 anodic and 50 cathodic) on 100 µm pitch. The trace thickness is 0.035 mm (1 oz Cu) and the trace to trace gap is 0.05 mm. Suppose also that four ACF bonds are prepared, with each bond being 3 mm wide. After applying a 50 VDC bias for 10 seconds, a leakage current of 0.5 mA is measured.

$$pi = \frac{(50)(4)(3)(0.035)(99)}{(10)(0.0005)(0.050)} = 8.3E6\ \Omega - \text{cm}$$

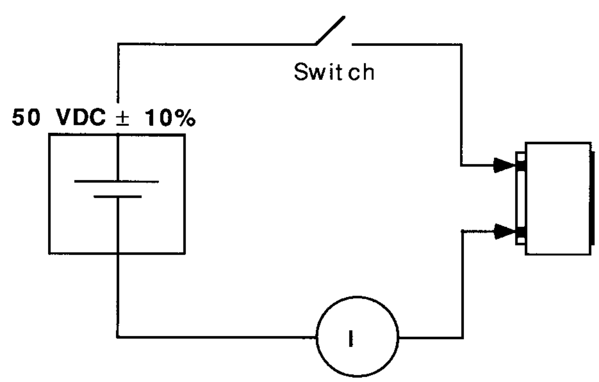

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Figure 4 Schematic Diagram for Insulation Resistivity Measurement