IPC-5703

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Cleanliness Guidelines for Printed Board Fabricators

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Cleanliness Guidelines for Printed Board Fabricators

Developed by the Bare Board Cleanliness Assessment Task Group (5-32c) within the Cleaning and Coating Committee (5-30) of IPC

Users of this publication are encouraged to participate in the development of future revisions.

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1 SCOPE

1.1 Introduction In many IPC standards development meetings, those individuals responsible for assessing the quality of incoming unpopulated printed boards have lamented the fact that bare printed board cleanliness is often an unknown quality parameter, often with undesired results. This is often due to the lack of understanding of materials and processes by the fabricator, or more often because the industry has driven margins so low that experienced process professionals cannot be retained by the fabricator.

Therefore, the IPC 5-32c Bare Board Cleanliness Task Group resolved to generate guidelines on those factors in the printed board fabrication process which can directly or indirectly affect the final cleanliness of packaged bare printed boards. This document is intended to be a general tutorial on items in the printed board fabrication process which can affect, directly or indirectly, cleanliness.

1.2 Why Printed Board Cleanliness is Important One of the aspects of printed board assembly reliability is electrochemical reliability, which is related to the residues left on an assembly. Some residues are benign while others are harmful. Electrochemical failure mechanisms are comprised of three elements: (1) an ionic residue; (2) an electrical potential or voltage gradient; and (3) moisture or humidity. All three must be present at some minimum level (which varies) for electrochemical failures to occur. Electrochemical failures are evidenced in two primary areas: (1) unacceptable leakage currents under humid conditions, and (2) electrochemical migration (dendritic growth). An example of dendritic growth can be seen in Figure 1-1.

Figure 1-1 Examples of Dendritic Growth

The Venn diagram shown in Figure 1-2 is useful in understanding the relation between these three factors. The amount of impact can be visualized by considering the diameter of the individual circles to be proportional to the forcing function. As an example, if a device is operating in a very humid environment, the diameter of the humidity circle grows larger as does the electrochemical failure region. In addition, operating temperature and time can compound or accelerate these factors. Higher temperatures can increase dissolution of residues and can accelerate electrochemical reaction rates. If service lives are long, the risk of electrochemical failures increases.

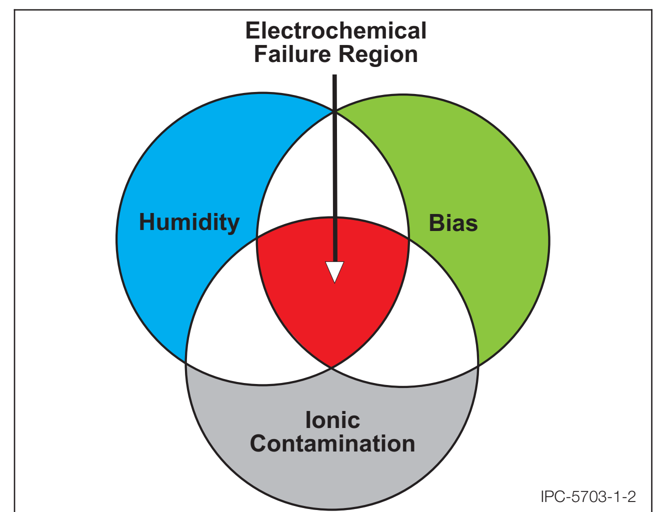

Figure 1-2 Venn Diagram Illustrating Variables Affecting Electrochemical Failure

Every printed board, or printed board assembly made from such boards, has a different cleanliness need. Unfortunately, not many assemblers or OEMs know how to determine how clean their assemblies have to be. There have been many instances where the present printed board cleanliness test methods, such as resistivity of solvent extract (ROSE) testing, have been inadequate to determine the true cleanliness of printed boards or assemblies.

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