IPC-8971

2022 - November

Requirements for Electrical Testing of Printed Electronics E-Textiles

An international standard developed by IPC

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Developed by Printed Electronics E-Textiles Electrical Test Task Group (D-74a) of the E-Textiles Committee (D-70) of IPC

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

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Acknowledgment

Any document involving a complex technology draws material from a vast number of sources. While the principal members of the Printed Electronics E-Textiles Electrical Test Task Group (D-74a) of the E-Textiles Committee (D-70) of IPC are shown below, it is not possible to include all of those who assisted in the evolution of this standard. To each of them, the members of the IPC extend their gratitude.

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Requirements for Electrical Testing of Printed Electronics E-Textiles

1 SCOPE

This document is intended to assist in selecting the test equipment, test parameters, test data and fixturing required to perform electrical test(s) on printed electronics on e-textiles.

Printed electronics on e-textiles are printed electronics on coated or treated textile substrates.

Coatings and treatments may be applied for printability of the textile substrate and/or for performance of the textile substrate or finished printed electronics e-textile (e.g., hydrophobic, water retardance, flame retardance, surface energy). Coatings or treatments may be applied using printing, lamination or other processes.

1.1 Purpose Electrical testing verifies that the conductive networks on the printed electronics on e-textile are interconnected according to the design requirements. Electrical testing does not ensure that the printed electronics on e-textile can be assembled or that the printed electronics on e-textile meets all of the customer's requirements. Many physical characteristics of the conductors (e.g., dimensional accuracy, conductor geometry and registration, presence of holes) cannot be determined by electrical test. Other checks should be employed to confirm these characteristics.

1.1.1 Introduction Electrical testing of printed electronics on e-textile ensures conformance to the electrical design requirements. This document defines different levels of testing available to achieve this purpose. In selecting the appropriate test level, technology, equipment and associated fixturing, a suitable compromise between productivity, features and costs can be found.

1.1.2 Costs of Test Equipment The costs associated with electrical testing can vary dramatically. Costs alone, however, should never be the only criteria for selecting the appropriate test level and equipment. As shown in Figure 1-1, many other important areas require consideration. For example, spacing and density of a printed electronics on e-textile design may be of paramount importance to one user, while another may be concerned with testing parameters and service reliability. Therefore, a careful examination of all areas of concern and how they may affect each other, not just how they perform individually, is significant. Whatever the selection criteria may be, qualifying benchmarks should be performed on known test equipment.

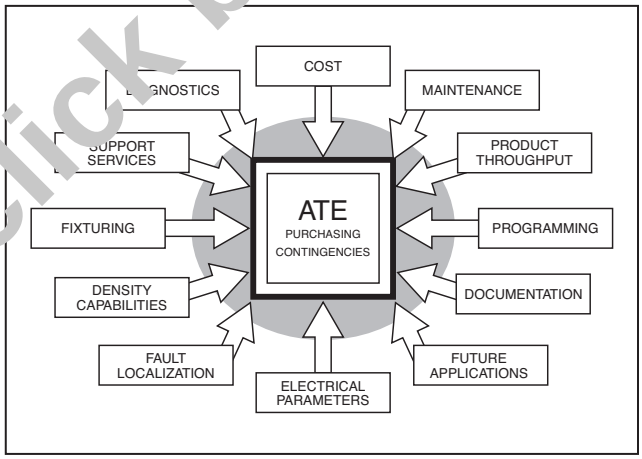

Figure 1-1 Automatic Test Equipment (ATE) Selection Criteria

1.2 Classification IPC standards recognize that electrical and electronic assemblies are subject to classifications by intended end-item use. Three general end-product classes have been established to reflect differences in manufacturability, complexity, functional performance requirements and verification (inspect/test) frequency. It should be recognized that there may be overlaps of equipment between classes.

CLASS 1 General Electronics Products
Includes products suitable for applications where the major requirement is function of the completed assembly.

CLASS 2 Dedicated Service Electronic Products
Includes products where continued performance and extended life is required, and for which uninterrupted service is desired but not critical. Typically, the end-use environment would not cause failures.

CLASS 3 High Performance/Harsh Environment Electric Products
Includes products where continued high performance or performance-on-demand is critical, equipment downtime cannot be tolerated, end-user environment may be uncommonly harsh, and the equipment and must function when required, such as life support or other critical systems.

1.2.1 Selection of the Proper Test Level All testing levels (see Section 3) defined in this document are intended to check electrical functionality of the design. However, the test level specified will affect test comprehensiveness. For example, when selecting test voltages and resistances for the printed electronics on e-textile, the user needs to consider both the final application of the printed electronics on e-textile and the level of defect analysis needed to ensure acceptable product. Electrical testing parameters that allow high productivity could also allow higher defect escape rates.