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Pressure Sensitive Adhesive (PSA) Assembly Guidelines for Flexible, Rigid or Rigid-Flex Printed Boards

Developed by the Flexible Circuits Base Materials Subcommittee (D-13) of the Flexible Circuits Committee (D-10) of IPC

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

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1 INTRODUCTION

This document is intended to provide the designer/user with information related to the use of pressure sensitive adhesives (PSAs) for assembly of flexible printed boards and membrane switches. This guide provides information on adhesive types available and processes suggested for their proper use, highlights strengths, weaknesses, or limitations, how to start implementation and where to find additional information.

1.1 Scope This document provides guidelines for the use of PSAs in single or double sided flexible printed circuits (see Figures A2 through A8), membrane switches (see Figures A9 through A12) and component attachments (see Figures A1 and A13). In addition, the guideline describes the type of materials and processes that may be used to accomplish proper assemblies.

1.2 Purpose This document is intended as a **guide** to the user by seeking answers to questions related to accepted, effective methods for the use of PSAs in FPC assemblies. **The methods described herein are not specifications.** PSA technology is continuously evolving such that applications and requirements may vary beyond the scope of this publication.

1.3 Classification of PSAs

1.3.1 Physical Characteristics

A. Unsupported transfer adhesive on release liner(s).

B. Adhesive coated on one side of a film, foil, foam, or paper carrier.

C. Adhesive coated on two sides of a film, foil, foam, or paper carrier.

D. Liquid (UV curable) PSA that is screen printable.

1.3.2 Adhesive Types Pressure Sensitive Adhesive (PSA) is a term used to designate a distinct category of adhesives and adhesive tapes which in their dry (solvent-free) form are permanently tacky at room temperature and adhere to a variety of dissimilar surfaces upon contact with light pressure from a finger, hand, roller or other device.

Pressure Sensitive Adhesives can be made from a variety of elastomers (rubber-like materials) compounded with additional ingredients to enhance performance, reduce the effect of environmental degradation and provide for appearance. The largest volume of PSAs are made from natural and/or synthetic rubber, thermoplastic block copolymers, acrylic and silicone polymers.

Many of the rubber and thermoplastic elastomers are formulated with low molecular weight additives called tackifiers to increase the tackiness and peel adhesion of the base rubber (elastomer). Tackifiers for non-silicone elastomers are obtained from wood rosin, terpene resins and also from certain petrochemical products. Terpene resins and fully hydrogenated synthetic tackifying resins provide for superior environmental aging of the PSA. Certain acrylate and silicone elastomers are inherently tacky; a variety of acrylic PSAs may be produced by changing the acrylic monomer composition. Silicone tackifiers are made from another silicone polymer which has a three dimensional structure.

Other ingredients called plasticizers can be added to the base rubbers to soften the PSA and improve tack performance. Low molecular weight additives contained in a PSA have the potential to react with the base elastomer resulting in reduced adhesive performance and transfer of chemical residue to the mating surface. Diffusion of additives out of the PSA can produce a ‘‘drying out’’ effect or loss of tack over time.

Antioxidants are added to non-silicone and non-acrylic PSA formulations to protect against oxidation of the elastomer. Oxygen chemically attacks the PSA and lowers the cohesive strength of the adhesive by breaking the polymer chains. Several antioxidants are added to protect PSAs, (other than acrylics and silicones), from degradation due to UV light, heat and the effects of oxygen. A color change may occur at the bond interface with certain antioxidants.

Inert fillers can be added to reduce cost, increase strength and alter the appearance of the PSA. Metal or ceramic fillers may be added to give the PSA the added functionality of electrical or thermal conductivity or both.