ASSOCIATION CONNECTING
ELECTRONICS INDUSTRIES

# IPC-3408

## General Requirements for Anisotropically Conductive Adhesive Films

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# General Requirements for Anisotropically Conductive Adhesive Films

## 1.0 SCOPE

This document covers requirements and test methods for anisotropically conductive adhesive films used to bond and electrically connect components and for their long-term properties as a part of the printed wiring board assembly. Applications include the following: flexible PWB-to-glass, flexible PWB-to-rigid PWB, flip chip-to-glass, flip chip-to-flexible PWB, flip chip-to-rigid PWB, and fine pitch SMD. The adhesive film may be supplied pre-attached to a flexible circuit or other product.

**1.1 Purpose** This standard defines anisotropically conductive adhesive films (also known as Z-axis films, ZAF) through specification of test methods and inspection criteria.

### 1.2 Adhesive Classification

**1.2.1 Anisotropically Conductive Film (ACF)** Anisotropic films are either tacky or non-tacky films made with a controlled dispersion of conductive particles, such that the particles do not contact each other in the plane of the film. The conductors are usually present in concentrations of less than 20% by volume. During the bonding process the particles come into contact with the mated conductor lines to allow conduction through the adhesive film thickness.

**1.2.2 Thermoplastic** Thermoplastic adhesives soften and become tacky at elevated temperatures forming a bond and making the electrical connection. The elevated temperatures do not cause a chemical change in the adhesive, only a certain degree of melting.

**1.2.3 Thermoset** Thermoset adhesives cure at an elevated temperature, generally developing higher strength and stability than thermoplastic materials, but are not as easily reworked because of the permanent change that occurs during cure. Fully-cured thermosets may soften upon subsequent exposure to high temperatures, but will not melt or flow.

**1.2.4 Thermoset/Thermoplastic Combinations** Thermoset and Thermoplastic adhesives can be combined to achieve the greater bond stability of thermosets, particularly at high temperatures, while retaining some of the processing advantages of thermoplastics.

**1.3 Terms and Definitions** The definition of terms shall be in accordance with IPC-T-50, except as defined in 1.3.1-1.3.19.

**1.3.1 Accelerated Aging** A means whereby the deterioration of an adhesive system encountered in natural aging (i.e., temperature and humidity) can be hastened and reproduced in the laboratory.

**1.3.2 Compliant Layer** A material interposed between the hot bar and flexible circuit to help even out applied pressure variations across the bond area.

**1.3.3 Creep** The plastic flow under a sustained load. Sustained loads in an adhesion bond can originate from an external source (vibration or tensile load) or can also be present in the form of thermal sources. Thermal stresses can be induced both by the bonding process and by temperature excursions. Creep in the adhesion joint can result in loss of contact force, so it is a potential failure mechanism.

**1.3.4 Cure** A change in the physical properties of an adhesive by a chemical reaction. Curing can be affected by the application of heat through convection or conduction, by the use of radiation such as infrared or ultraviolet energy, or in standard temperature and pressure conditions with the aid of catalysts. This is usually accompanied by a change in the glass transition temperature (Tg) and the melting temperature (Tm) with an accompanying increase in the modulus of elasticity. Curing usually involves molecular weight increases and/or cross-linking of the adhesive resin.

**1.3.5 Failure, Adhesive** The rupture of an adhesive bond such that the separation appears to be at the adhesive-adherent interface.

**1.3.6 Failure, Cohesive** The rupture of an adhesive bond such that the separation appears to be within the adhesive.

**1.3.7 Fillet** The portion of an adhesive which fills the corner or angle formed where two adherends are joined.

A berm is a ridge of adhesive that forms around the perimeter of a thermode during bonding from the flow caused by compression of the bond area.

**1.3.8 Green Strength** The strength of a joint or assembly with an uncured adhesive.

**1.3.9 Insulation Resistance** A measure of the capability of the adhesive to insulate adjacent conductors from each other.