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International Electrotechnical Commission, 3, rue de Varembé, PO Box 131, CH-1211 Geneva 20, Switzerland
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: inmail@iec.ch Web: www.iec.ch

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PRINTED BOARD DESIGN, MANUFACTURE AND ASSEMBLY – TERMS AND DEFINITIONS

FOREWORD

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International Standard IEC 60194 has been prepared by IEC technical committee 91: Electronics assembly technology.

This fifth edition cancels and replaces the fourth edition (1999) and constitutes a technical revision.

The major change with regard to the previous edition concerns the addition of some four hundred new terms necessary to industry, added as a result of considerable development in assembly technology in recent years.

The text of this standard is based on the following documents:

FDIS	Report on voting
91/566/FDIS	91/578/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

IEC 60194 should be read in conjunction with IEC 60050(541) which provides for basic technical terms for board assembly technology not included in this standard.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this standard may be issued at a later date.

PRINTED BOARD DESIGN, MANUFACTURE AND ASSEMBLY – TERMS AND DEFINITIONS

1 Scope

This International Standard defines the terminology used in the field of printed circuit boards and printed circuit board assembly products.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050(541), *International Electrotechnical Vocabulary (IEV) – Chapter 541: Printed circuits*

3 General

The terms have been classified according to the decimal classification code (DCC) and this DCC number appears to the right of the defined term. The DCC numbering is explained fully in Annex A.

In order to avoid two ID numbers, the usual practice of numbering every paragraph (every term and definition) in front of the paragraph has not been followed in this standard. The official IEC number is the number which follows the DCC and the period (21.xxxx). Annex B provides a list of acronyms listed numerically according to the DCC number.

4 Terms and definitions

Abrasion Resistance **54.1821**
The ability of a material to withstand surface wear.

Abrasive Trimming **54.1318**
Adjusting the value of a film component by notching it with a finely- adjusted stream of an abrasive material against the resistor surface.

Absorption Coefficients **40.1727**
The degree to which various materials absorb heat or radiant energy when compared to each other.

Absorptivity, Infra-red **40.0087**
The ratio (or percentage) of the amount of energy absorbed by a substrate as compared with the total amount of incident energy.

Accelerated Aging **93.0001**
A test in which the parameters such as voltage and temperature are increased above normal operating values to obtain observable or measurable deterioration in a relatively short period of time.

Accelerated Life Test **93.0119**
See “Accelerated Aging”.

Accelerated Test **93.0216**
A test to check the life expectancy of an electronic component or electronic assembly in a short period of time by applying physically severe condition(s) to the unit under test.

Accelerator **53.0002**
See “Catalyst”.

Acceleration Factor (AF) **93.0260**
The ratio of stress in reliability testing to the normal operating condition.

Acceptance Quality Level (AQL) **90.0003**
The maximum number of defectives likely to exist within a population (lot) that can be considered to be contractually tolerable; normally associated with statistically derived sampling plans.

Acceptance Tests **92.0004**
Those tests deemed necessary to determine the acceptability of a product and as agreed to by both purchaser and vendor.

Acceptance Inspection (Criteria) **92.0288**
An inspection that determines conformance of a product to design specifications as the basis for acceptance.

Access Hole **60.1319**
A series of holes in successive layers of a multilayer board, each set having their centres on the same axis. These holes provide access to the surface of the land on one of the layers of the board. (See Figure A.1.)

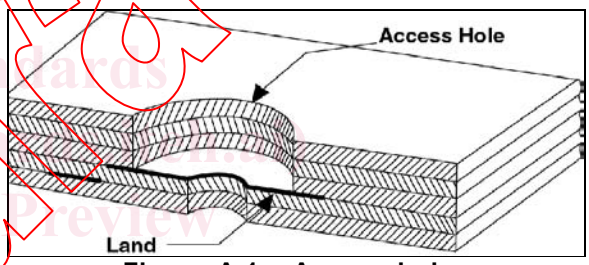


Figure A.1 – Access hole

Access Protocol **21.0005**
An agreed principle for establishing how nodes in a network communicate electronically.

Accordion Contact **36.0006**
A type of connector contact that consists of a flat spring formed into a "Z" shape in order to permit high deflection without overstress.

Accuracy **90.0007**
The deviation of the measured or observed value from the true value.

Acid Flux **46.0009**
A solution of an acid and an inorganic, organic, or water soluble organic flux. (See also “Inorganic Flux,” “Organic Flux,” and “Water Soluble Organic Flux”.)

Acid Number **54.0010**
The amount of potassium hydroxide in milligrams that is required to neutralize one gram of an acid medium.

Acid Value **54.1217**
See “Acid Number”

Acid-Core Solder **46.0008**
Wire solder with a self-contained acid flux.

Actinic Radiation **52.0011**
Light energy that reacts with a photosensitive material in order to produce an image.

Active Desiccant **30.0397**
Desiccant that is either fresh (new) or has been baked according to the manufacturer’s recommendations to renew desiccant to original specifications.

Activated Rosin Flux **46.0012**
A mixture of rosin and small amounts of organic-halide or organic-acid activators. (See also “Synthetic Activated Flux”.)

Activating **53.0013**
A treatment that renders nonconductive material receptive to electroless deposition.

Activating Layer **53.0014**
A layer of material that renders a nonconductive material receptive to electroless deposition.

Activator **46.0015**
A substance that improves the ability of a flux to remove surface oxides from the surfaces being joined.

Active Device **30.0016**
An electronic component whose basic character changes while operating on an applied signal. (This includes diodes, transistors, thyristors, and integrated circuits that are used for the rectification, amplification, switching, etc., of analog or digital circuits in either monolithic or hybrid form.)

Active Metal **36.0017**
A metal that has a very high electromotive force.

Active Trimming **54.1321**
Adjusting the value of a film circuit element in order to obtain a specified functional output from the circuit while it is electrically activated.

Actual Size **90.0018**
The measured size.

Additive Process **53.1322**
A Process for obtaining conductive patterns by the selective deposition of conductive material on clad or unclad base material. (See also “Semi-Additive Process” and “Fully-Additive Process”.)

Add-On Component **30.0019**
Discrete or integrated packaged or chip components that are attached to a film circuit in order to complete the circuit's function.

Adhesion (Pressure Sensitive Tape) **46.2038**
The bond produced by contact between pressure-sensitive adhesive and a surface.

Adhesive **46.1728**
A substance such as glue or cement used to fasten objects together. In surface mounting, an epoxy adhesive is used to adhere SMDs to the substrate.

Adhesion Failure **96.0020**
The rupture of an adhesive bond such that the separation appears to be at the adhesive-adherent interface.

Adhesion Layer **74.0021**
The metal layer that adheres a barrier metal to a metal land on the surface of an integrated circuit.

Adhesion Promotion **53.0022**
The chemical process of preparing a surface to enhance its ability to be bonded to another surface or to accept an over-plate.

Adhesive Coated Substrate **41.0438**
A base material upon which an adhesive coating is applied, for the purpose of retaining the conductive material (either additively applied or attached as foil for subtractive processing), that becomes part of a metal-clad dielectric.

Adhesive-Coated Catalyzed Laminate **41.1320**
A base material with a thin polymer coating, that contains a plating catalyst, that is subsequently treated in order to obtain a microporous surface.

Adhesive-Coated Uncatalyzed Laminate **41.1323**
A base material with a thin polymer coating, that does not contain a plating catalyst, that is subsequently treated in order to obtain a microporous surface.

Adhesive Transfer (Pressure Sensitive Tape) **75.0558**
The transfer of adhesive from its normal position on the pressure sensitive tape to the surface to which the tape was attached, either during unwind or removal.

Adsorbed Contaminant **96.0023**
A contaminant attracted to the surface of a material that is held captive in the form of a gas, vapour or condensate.

Advanced Statistical Method **91.0024**
A statistical process analysis and control technique that is more- sophisticated and less widely-applicable than basic statistical methods.

Aging **90.0025**
The change of a property, e.g. solderability, with time. (See also “Accelerated Aging”.)

Air Contamination **14.0026**
See “Air Pollution”

Air Pollution **14.0027**
Contamination of the atmosphere with substances that are toxic or otherwise harmful.

Algorithm **11.0849**
A set of procedures for the solution of a problem in a series of steps.

Alignment Mark **22.0030**
A stylized pattern that is selectively positioned on a substrate material to assist in alignment. (See Figure A.2).

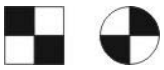


Figure A.2 – Alignment mark

Aliphatic Solvents **76.0031**
"Straight chain" solvents, derived from petroleum, of low solvent power.

Alkaline Cleaner **76.0032**
A material blended from alkali hydroxides and alkaline salts.

All Metal Package **33.0579**
A hybrid circuit package made solely of metal, without glass or ceramic.

Allowable Temperature **75.0609**
The temperature range that an electronic circuit or component can perform its intended functions.

Alloy, Tin Bismuth (Sn-Bi) **45.1947**
An alloy that is used as a lead free solder and consisting of tin and bismuth as the main constituents. Sn-Bi58 has a low melting point of 138 °C, but is not widely used because of its brittle properties.

Alloy, Tin Copper (Sn-Cu) **45.1948**
An alloy that is used as a lead free solder consisting of tin and copper considered to be applicable for wave or reflow soldering.

Alloy, Tin Silver (Sn-Ag) **45.1949**
An alloy that is used as a lead free solder and consisting of tin and silver as the main constituents used as a high temperature solder.

Alloy, Tin Silver Bismuth (Sn-Ag-Bi) **45.1950**
An alloy that is used as a lead free solder and consisting of tin, silver and bismuth as the main constituents. The Bi in Sn-Ag-Bi alloy reduces the melting temperature. The higher the Bi content is, higher the mechanical strength, but with poorer elongation capability. There is a limit to Bi content.

Alloy, Tin Silver Copper (Sn-Ag-Cu) **45.1951**
An alloy that is used as a lead free solder consisting of tin, silver and copper as the main constituents.

Alloy, Tin Zinc (Sn-Zn) **45.1952**
An alloy that is used as a lead free solder and consisting of tin and zinc as the main constituents. Zn09 alloy has the melting point of 199 °C, closest to the melting point of Sn-Pb alloy among lead free solders, which allows soldering work at present soldering temperatures, but tends to form a

stable oxide film, causing difficulty in securing a good solder wetting.

Alpha Error **91.0033**
The size of a Type I error or the probability of rejecting a hypothesis that is true.

Alphanumerical **25.1729**
Pertaining to data that contain the letters of an alphabet, the decimal digits, and may contain control characters, special characters and the space character.

Alpha Particle **35.0612**
A He^4 nucleus generated from a nuclear decay that is capable of generating hole-electron pairs in microelectronic devices and switching cells causing soft errors in some devices.

Alternating Current (ac) **21.1793**
A current that varies with time, commonly applied to a power source that switches polarity many times per second, in the shape of a sinusoidal, square, or triangular wave.

Alternative Hypothesis **93.1324**
The supposition that a significant difference exists between the desired results of two comparable populations. (See also "Null Hypothesis" and "Statistical Hypothesis".)

Alumina Substrate **43.1730**
Aluminum oxide used as a ceramic substrate material.

Ambient **29.0034**
The surrounding environment coming into contact with the system or component in question.

Amorphous Polymer **40.0035**
A polymer with a random and unstructured molecular configuration.

Amplitude, Voltage **21.0036**
The magnitude of a voltage as measured with respect to a reference, such as a ground plane.

Analog Circuit **21.0037**
An electrical circuit that provides a continuous relationship between its input and output.

Analysis of Variance (ANOVA) **91.0038**
The systematic method of statistically evaluating experimental results in order to separate the sources of variation.

Anchoring Spur **22.1325**
An extension of a land on a flexible printed board that extends beneath the coverlayer to assist in holding the land to the base material. (See Figure A.3.)

Figure A.3 – Lands with anchoring spurs

Angled Bond **74.0039**
The impression of the first and second bonds that are not in a straight line.

Anisotropic Conductive Contact **75.0675**
An electrical connection using an anisotropic conductive film or paste wherein conductive particles of gold, silver, nickel, solder, etc. are dispersed. When it is compressed, an electrical connection is attained only in the direction of compression.

Anisotropy **40.0685**
The condition for a substance having differing values for properties, such as permittivity, depending on the direction within the material.

Annotation **22.0040**
Text, notes, or other identification, constructed by a computer-aided system, intended to be inserted on a drawing, map or diagram.

Annular Ring
(Annular Width) **60.0041**
That portion of conductive material completely surrounding a hole. (See Figure A.4).

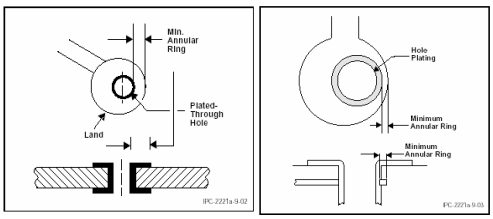


Figure A.4 – Annular ring (annular width)

Anode (BGA) **33.0689**
The electrode from which the forward current flows within the device.

Anodic Cleaning **57.0042**
Electrolytic cleaning in which the work is the anode.

Aperture (stencil) **73.0690**
An opening in the stencil-foil.

Apparent Field-of-View Angle **92.0043**
The angular subtense of the field-of-view in the image space of an optical system.

Application Specific Integrated Circuit (ASIC) **33.0692**
A semiconductor device intended to satisfy a unique complete circuit function.

Aqueous Flux **46.0044**
See “Water Soluble Organic Flux”

Aramid **44.0045**
See “Para-aramid”

Arc Resistance **92.0047**
The resistance of a material to the effects of a high voltage, low current arc (under prescribed conditions) passing across the surface of the material. (The resistance is stated as a measure of total elapsed time at that voltage required to form a conductive path on the surface - material carbonized by the arc).

Architecture **11.0046**
The structure of a computer's functional elements that makes it possess specific maximum and minimum capabilities.

Area Array **34.0751**
A bonding pattern in which edge and additional pads on the inner surface area of the chip are addressed in the bonding scheme. (See Figure A.5).

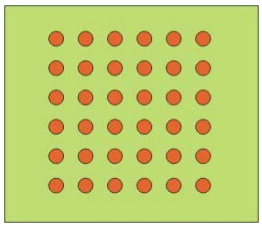


Figure A.5 – Area array

Area Array Tape Automated Bonding **74.0048**
Tape automated Bonding where some carrier tape terminations are made to lands within the perimeter of the die.

Area Ratio **73.0758**
The ratio of the area of aperture opening to the area of aperture walls.

Array **22.0049**
A group of elements or circuits arranged in rows and columns on a base material.

Artificial Intelligence **11.0050**
The capacity of a machine to perform functions that are normally associated with human intelligence, such as reasoning and learning.

Artwork **22.0051**
An accurately-scaled configuration that is used to produce the "Artwork Master" or "Production Master”. (See Figure A.6.)

Artwork Master **24.0052**
An accurately-scaled, usually 1:1, pattern that is used to produce the "Production Master”. (See Figure A.6.)

As-Fired **45.0054**
The condition (values) of thick-film components or the smoothness of ceramic base materials, after they have been processed in a firing furnace and prior to trimming or polishing.

Aspect Ratio (Film) **74.0055**
The ratio of the length of a film component to its width.

Aspect Ratio (Hole) **53.0056**
The ratio of the length or depth of a hole to its preplated diameter. (See Figure A.7.)

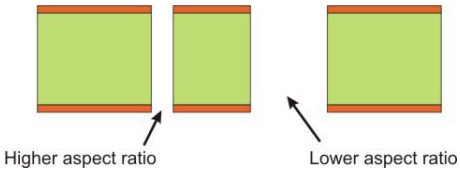


Figure A.7 – Aspect ratio (hole)

Aspect Ratio (stencil) **73.0808**
The ratio of the width of the aperture to the thickness of the stencil-foil.

Assembled Board **80.0057**
See “Assembly”.

Assembly **80.1327**
A number of parts, subassemblies or combinations thereof joined together. (Note: This term can be used in conjunction with other terms listed herein, e.g. "Printed Board Assembly”.)

Assembly Drawing **26.1328**
A document that depicts the physical relationship of two or more parts, a combination of parts and subordinate assemblies, or a group of assemblies required to form an assembly of a higher order.

Assembly Language **11.0058**
A computer language made up of brief expressions that an assembler program can translate into a machine language.

Assembly Manufacturer **70.1911**
The individual, organization, or company responsible for the assembly process and verification operations necessary to ensure full compliance of assemblies.

Assignable Cause **91.0059**
See “Special Cause”.

Asymmetric Stripline **21.0060**
A stripline signal conductor that is embedded, but not centreed, between two ground planes. (See Figure A.8).

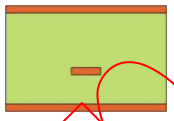
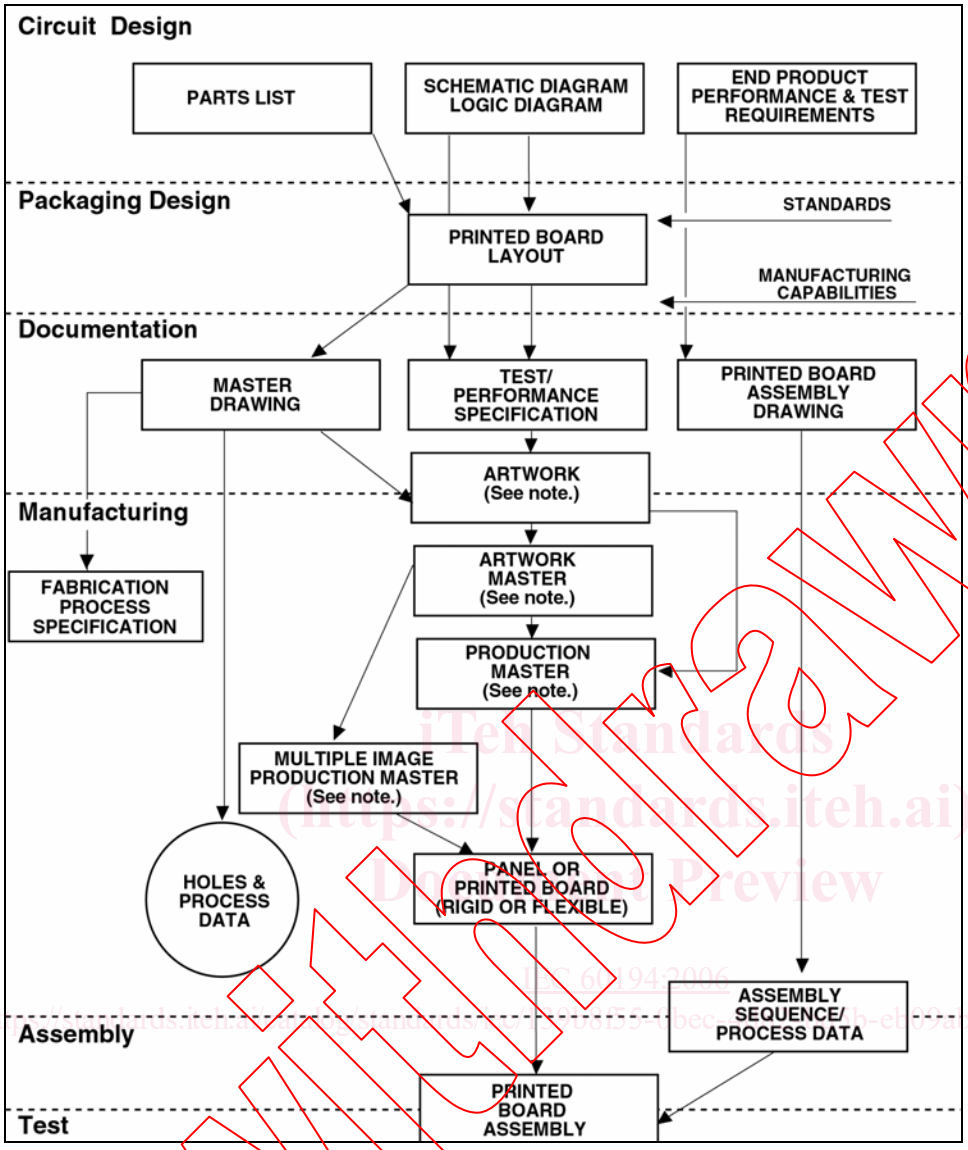


Figure A.8 – Asymmetric stripline

Attachment Density **22.1823**
The average number of surface mount or through hole solder joints, based on pitch and land size, that may be accommodated in a prescribed unit area e.g. cm^2, considering land size within the unit area to accommodate solder joint attachment.

Attenuation **21.0061**
The reduction in the amplitude of a signal due to losses in the media through which it is transmitted. The unit of measure is decibels (dB).



NOTE The term "original" may be used to preface any of the drafting and photographic-tooling terms used in this figure. The "original" is not usually used in manufacturing processes. In the event that a "copy" is made, the copy must be of sufficient accuracy to meet its intended purpose if it is to take on the name of any one of the terms used in this figure. Other adjectives may also be used to help describe the kind of copy, i.e. "nonstable", "first generation," "record," etc.

Figure A.6 – Simplified flow chart of printed board design/fabrication sequence

Attributes Data **94.0062**
Qualitative data that can be counted for recording and analysis purposes.

Automated Component Insertion **72.0063**
The act or operation of assembling discrete components to printed boards by means of electronically-controlled equipment.

Automatic Component Placement **22.0029**
Software that automatically optimizes the layout of components on a printed board.

Automatic Conductor Routing **22.0124**
Software that automatically determines the placement of interconnections on a printed board.

Automatic Dimensioning **25.1329**
A computer-aided drafting function that automatically generates dimensions, leaders, arrowheads, etc., that make up a complete set of documented dimensions.

Automatic Test Equipment **92.0064**
Equipment that automatically analyses functional or static parameters in order to evaluate performance.

Automatic Test Generation **92.0065**
Computer generation of a test program based solely on circuit topology with little or no manual programming effort.

Axial Lead **31.0067**
Lead wire extending from a component or module body along its longitudinal axis. (See Figure A.9).

Figure A.9 – Axial Lead

Azeotrope **49.0068**
See "Azeotropic Mixture"

Azeotropic Mixture (Azeotrope) **49.1330**
A liquid mixture of two or more substances that behaves like a single substance. The vapour produced by partial evaporization of the liquid has the same composition as the liquid.

B-Stage **41.1343**
An intermediate stage in the reaction of a thermosetting resin in which the material softens when heated and swells, but does not entirely fuse or dissolve when it is in contact with certain liquids. (See also "C- Staged Resin".)

B-Staged Material **41.0069**
See "Prepreg".

B-Staged Resin **41.0070**
A thermosetting resin that is in an intermediate state of cure. (See also "C-Staged Resin".)

Back Annotation **21.0072**
The process of extracting appropriate information from a completed printed board design and inserting it on the boards schematic diagram.

Back Bonding **74.0073**
Attaching a die to a base material with its circuitry facing away from the base material. (See Figure B.1).

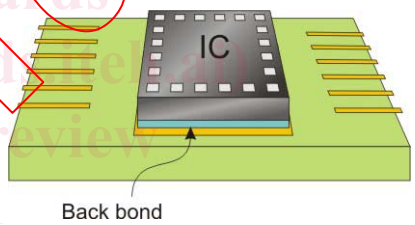


Figure B.1 – Back Bonding

Back Mounting **74.0079**
See "Back Bonding".

Back Taper(s) **51.0081**
The constant decrease in diameter along the length of the body of a drill.

Back-Bared Land **22.0071**
A land in flexible printed wiring that has a portion of the side normally bonded to the base dielectric material exposed by a clearance hole. (See Figure B.2).

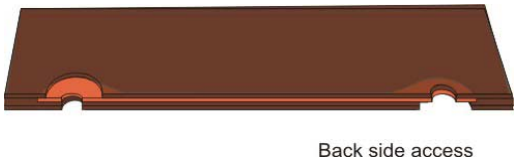


Figure B.2 – Back-bared land