



<b>Term</b>	<b>Definition</b>	<b>Ellipsis</b>
A STAGE	The condition of low molecular weight of a resin polymer during which the resin is readily soluble and fusible.	
ABSORPTION	The amount of moisture a given substance will assimilate and retain. It is an important property consideration in the selection of insulating materials.	
ACCELERATOR	A chemical that is used to speed up reaction or cure, as cobalt naphthenate is used to accelerate the reaction of certain polyester resins. It is often used along with a catalyst, hardener, or curing agent. The term "accelerator" is often used interchangeably with the term "promoter".	
ACCESS HOLES	A series of holes in successive layers, each set having a common center or axis. These holes of a multilayer printed board provide access to the surface of the land in one of the layers of the board.	
ACID FLUXES	See corrosive fluxes.	
ACTIVATING	A treatment that renders nonconductive material receptive to electroless deposition. Nonpreferred synonyms: Seeding, Catalyzing, and Sensitizing.	
ACTIVATING DEVICE	An electrical element capable of modifying an input voltage in such a way as to achieve rectification, amplification, or switching action, e.g., tubes, transistors, relays, etc.	
ADAPTOR	A device which locates and supports products to be tested. Generally, it is made of an insulating material with locator pins mounted to precisely position the product to a spring contact probe test pattern. Also, an adaptor serves as an intermediate between the circuit verifier and the interchangeable test head that contains the test pattern.	
ADDITIVE PROCESS	A process for obtaining conductive patterns by the selective deposition of conductive material on unclad base material. See also: Semi-Additive Process and Fully-Additive Process.	
ADHESIVE	Broadly, any substance used in promoting and maintaining a bond between two materials. A wide range of materials including animal and vegetable type glues, rubbers, elastomers, thermosetting and thermoplastic resins, ceramics, and hot melts. Adhesives are used extensively for bonding, sealing and joining laminates, films and foils, coils, conductors, etc.	
ADMITTANCE	The measure of ease with which an alternating current flows in a circuit. The reciprocal of impedance.	
AGING	The change in properties of a material with time under specific conditions.	
ALUMINUM FOIL	A thin continuous sheet of aluminum sometimes used as a printed circuit conductor.	
AMBIENT	The surrounding environment coming into contact with the system or component in question.	
AMBIENT TEMPERATURE	The temperature of the cooling medium, such as gas or liquid, which comes into contact with the heated parts of an apparatus (or the normal temperature of the surrounding environment).	
AMPERE	A unit of current. It is the current flowing through one ohm of resistance at one volt potential. $I=E/R$	
ANCHORING SPURS	Extensions of the lands on flexible printed wiring extending beneath the cover layer to assist in holding the lands to the base material.	



<b>Term</b>	<b>Definition</b>	<b>Ellipsis</b>
ANNEAL	To heat a metal and cool slowly to relieve hardness or brittleness that may have occurred naturally or have been induced by pressure or bending.	
ANNOTATION	Text or legend pertinent to a board design; text appears off the board area and consists of lettering and symbols while legend appears on the board.	
ANNULAR RING	The circular strip of conductive material that completely surrounds a hole.	
ANODIC SILVAR	A precious metal used in plating; fine silver in different configurations such as shot, cones, bars, etc.; is sacrificed during the silver plating process.	
ANTISTATIC SPRAYS	Chemical agents which, when applied to circuits, and plastic surfaces leave a conductive coating which acts to repel dust and dirt and changes surfaces characteristics. Good antistatic sprays will leave a resistivity reading of 20-100 megohms per square inch on plastics and 100 megohms or more per square inch on glass surfaces. See Static Eliminators.	
ANVIL	That part of the crimping die - normally stationary - which positions and supports the terminal during crimping. Sometimes called Nest.	
ARC RESISTANCE	(A) The time required for an arc to establish a conductive path in a material. (B) 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 required to form a conductive path on the surface (material carbonized by the arc).	
ARTWORK	An accurately-scaled configuration which is used to produce the artwork master or production master.	
ARTWORK GENERATION	The process of transferring the idea for a circuit pattern into a precision, reproducible artwork master for mass production manufacturing. Generation can be executed by the traditional manual drafting and photographic technique, or via electronic means. See Photoplotters and Scribing Plotters.	
ARTWORK MASTER	An accurately scaled configuration used to produce the production master. (Usually 1-1)	
ARTWORK RESISTRATION SYSTEMS	Equipment of various sizes and complexities used to achieve artwork registration. Accuracy, repeatability of precision tolerances, and loading and unloading simplicity and speeds are significant aspects.	
BARREL	The portion(s) of a terminal or contact that is (are) crimped. When designed to receive the conductor it is called the wire barrel. When designed to support or grip the insulation, it is called the insulation barrel.	
BASE MATERIAL	The insulating material upon which the conductive pattern may be formed. The base material may be rigid or flexible.	
BASE MATERIAL THICKNESS	The thickness of the base material excluding metal foil cladding or material deposited on the surface.	
BED-OF-NAILS TECHNIQUE	A method of testing production volume printed circuit boards that is based on the theory that most errors should be caught during in-circuit component testing. A test fixture, heavily laden with contact pins, engages points on the board that are connected to the devices. Then, using active guarding techniques, the system can quickly determine the faulty devices.	
BELLOWS CONTACT	A connector contact which is a flat spring folded to provide a uniform spring rate over the full tolerance range of the mating unit.	
BENT LEAD	A lead that is bent either at an approximate 45 degree angle or, when used with offset lands, is formed to be in direct contact with the land.	



<b>Term</b>	<b>Definition</b>	<b>Ellipsis</b>
BEVELING MACHINES	Equipment that puts 90 degree edges or 15,30,45, or 60 degree bevels on printed circuit boards. Well-designed beveling machines collect dust or shavings in order to maintain high plant environment standards.	
BIFURCATED CONTACT	A connector contact (usually a flat spring) which is slotted lengthwise to provide additional, independently-operating points of contact.	
BIRDCAGE	A defect in stranded wire where the strands in the stripped portion between the covering of an insulated wire and a soldered connection (or an end-tinned lead) have separated from the normal lay of the strands.	
BLANK	An unprocessed or partially processed piece of base material, or metal-clad base material, cut form a sheet or panel and having the rough dimensions of a printed board.	
BLANK DIE	A printed circuit die which produces a part or blank of desired out-line from the material.	
BLEEDING	A condition in which a plated hole discharges process material or solution from crevices or voids.	
BLISTER	A localized swelling and separation between any of the layers of a laminated base material, or between base material and conductive foil. It is a form of delamination.	
BLISTERING	Localized swelling and separation between any of the layers of the base laminate or between the laminate and the metal cladding.	
BLOCK DIAGRAM	An electronic circuit diagram using blocks or rectangles to represent components, groups of components, or units of equipment. Conventional graphic symbols are sometimes used with the block symbol to clarify the diagram.	
BLOW HOLE	A void caused by outgassing.	
BOARD THICKNESS	The thickness of the metal-clad base material including conductive layer or layers. (May include additional platings and coatings depending upon when the measurement is made.)	
BOND LIFTOFF	The failure mode whereby the bonded lead separates from the surface to which it was bonded.	
BOND STRENGTH	The force per unit area required to separate two adjacent layers of a board by a force perpendicular to the board surface. See Peel Strenght.	
BONDING AGENT	The adhesive used to bond individual layers into a laminate.	
BONDING ISLAND	Synonymous with Bonding Pad.	
BONDING LAYER	An adhesive layer used in bonding together other discrete layers of a multilayer printed board during lamination.	
BONDING PAD	A metallized area at the end of a thin metallic strip to which a connection is to be made. Also called Binding Island.	
BOOTSTRAP	A feedback technique which tends to improve linearity and input impedance of circuits operating over a wide range of input signals.	
BOW	The deviation from flatness of a board characterized by a roughly cylindrical or spherical curvature such that, if the board is rectangular, its four corners are in the same plane. See Twist.	



Term	Definition	Ellipsis
BREADBOARD CIRCUIT	A circuit simulation using discrete components or partially integrated components to prove feasibility of a circuit.	
BREADBOARD MODEL	An assembly in rough form to prove the feasibility of a circuit, system, or principle.	
BREADBOARDS	Perforated substrates which facilitate trial positioning of circuit components and wiring arrangements leading to final circuit construction and packaging. They are used in design, construction, and assembly.	
BREAKAWAY PANELS	Hardboards held together in a grouping by using breakaway tabs. Breakaway panels make handling easier for automatic insertion and wave soldering. When necessary, boards can be separated by snapping them apart much like a soda cracker.	
BREAKDOWN VOLTAGE	The voltage at which an insulator or dielectric ruptures, or at which ionization and conduction take place in a gas or vapor.	
BRIDGING ELECTRICAL	The formation of a conductive path between conductors.	
BRUSH FLUXING	A specialized wave solder technique. A 360 degree bristled brush rotates in a foaming flux head to transfer the flux to the board. Also see: Spray fluxing, Wave fluxing, and Foam fluxing.	
B-STAGE	An intermediate stage in the curing of a thermosetting resin. In it a resin can be heated and caused to flow, thereby allowing final curing in the desired shape. The condition of a resin polymer when it is more viscous, with higher molecular weight, and insoluble but plastic and fusible.	
B-STAGE MATERIAL	Sheet material impregnated with a resin cured to an intermediate stage (B-stage resin). Prepreg is the preferred term.	
B-STATE LOT	The product from a single mix of B-stage ingredients.	
B-STATE RESIN	A resin in an intermediate stage of a thermosetting reaction. The material softens when heated and swells when in contact with certain liquids, but it may not entirely fuse or dissolve. The cure is normally completed during the laminating cycle.	
BUS	A circuit over which data or power is transmitted.	
BUS BARS	Power distribution components. Many consist of two or more conductor layers electrically insulated from one another and from other components by thin dielectric layers. Applications include distribution of power on printed circuit boards.	
BUS REACTOR	A current-limiting reactor connected between two buses (or between two sections of one bus) to limit and localize any disturbance caused by either bus or bus section.	
BUTTER COAT	An external layer of resin over the reinforcing structure of base material. See also: Resin-rich.	
CAMBER	The planar deflection of a flat cable or flexible laminate from a straight line of specified length. (A flat cable or flexible laminate with camber is similar to the curve of an unbanked race track.)	
CAPACITANCE	The property of a system of conductors and dielectrics which permits the storage of electricity when potential difference exists between the conductors.	<b>C</b>
CAPACITIVE COUPLING	The electrical interaction between two conductors caused by the capacitance between the conductors.	



<b>Term</b>	<b>Definition</b>	<b>Ellipsis</b>
CARD	Nonpreferred term for Printed Board.	
CARD CAGES, CARD RACKS	Containers which provide compact packaging of printed boards. Various sized, they hold varying numbers of cards; allow heat dissipation; and, in sophisticated models, incorporate a ground plane with connectors and DIP devices to take advantage of highly automated back panel wiring techniques.	
CARD GUIDE	A plastic or metal support for printed boards. It relieves the stress on connector contacts; makes insertion into, and extraction from, the connector easier; and eliminates the possibility of twisting the board.	
CATALYST	A chemical that causes or speeds up the cure of a resin but does not become a chemical part of the final product.	
CHLORINATED HYDROCARBON	An organic compound having chlorine atoms in its chemical structure. Trichloromethylene, methyl chloroform, and methylene chloride are chlorinated hydrocarbons.	
CIRCUIT	The interconnection of a number of electrical devices in one or more closed paths to perform a desired electrical or electronic function.	
CLAD	A condition of the base material, to which a relatively thin layer or sheet of metal foil (cladding) has been bonded on one or both of its sides. The result is called a metalclad base material.	
COAT	To cover with a finishing, protecting, or enclosing layer of any compound.	
COEFFICIENT OF EXPANSION	The fractional change in the dimension of a material with a unit change in temperature.	
COLD FLOW	The continuing dimensional change that follows initial instantaneous deformation in a non-rigid material under static load. Also called creep.	
COLLIMATION	The degree of parallelism of light rays from a given source. A light source with good collimation produces parallel light rays, whereas a poor light source produces divergent, nonparallel light rays.	
COMPONENT HOLE	A hole used for the attachment and electrical connection of a component termination, including pin or wire, to the printed board.	
COMPONENT INSERTION EQUIPMENT	Devices, ranging from simple hand tools to completely automated units, that aid an operator during component insertion. The pantograph is the simplest level of automated component insertion machinery, it typically inserts 1,500 to 2,000 axial lead components per hour. Controlled insertion machines use mini-computers to position the PC board, control the insertion cycle, provide automatic adjustment of span to accommodate a mix of component center distances, and provide the user with useful management information. The most advanced controlled insertion systems are automated board handling machines and inline assembly units. Both are high volume production units designed to provide the greatest number of component insertions annually with minimum downtime and board handling.	
COMPONENT SIDE	The side of the printed board on which most of the components will be mounted.	
COMPOSITE BOARD	The completely laminated multilayer printed wiring board.	
COMPOUND	A combination of elements in a stable molecular arrangement.	
COMPOUND DIE	A printed circuit die that combines two or more cutting operations, such as blanking and piercing. This is usually a single action die with all operations accomplished in one stroke.	



<b>Term</b>	<b>Definition</b>	<b>Ellipsis</b>
CONDITIONING	Time-limited exposure of a test specimen to a specified environment(s) prior to testing.	
CONDUCTIVE FOIL	A thin sheet of a conductive material that covers one side or both sides of the base material and is intended for forming the conductive pattern.	
CONDUCTIVE INK PROCESS	Method of forming conductor patterns by applying conductive inks. Employed when fast turn-around, ease of application, or repairability and changeability are important issues.	
CONDUCTIVE PATTERN	The configuration or design of the electrically conductive material on the base material. Includes conductors, lands, and through connections when these connections are an integral part of the manufacturing process, such as additive.	
CONDUCTIVITY	The ability of a material to conduct electric current. It is expressed in terms of the current per unit of applied voltage. It is the reciprocal of resistivity.	
CONDUCTOR	A single conductive path in a conductive pattern.	
CONDUCTOR BASE WIDTH	The conductor width at the plane of the surface of the base material. See also: Conductor Width and Design Width of Conductor.	
CONDUCTOR LAYER	The total conductive pattern formed upon one side of a single layer of base material. See also Physical Layer.	
CONDUCTOR LAYER NO.1	The first layer having a conductive pattern of a multilayer printed board on or adjacent to the component side.	
CONDUCTOR SIDE	The side of a single-sided printed board containing the conductive pattern.	
CONDUCTOR SPACING	The distance between adjacent edges (not centerline to centerline) of isolated conductive patterns in a conductor layer.	
CONDUCTOR THICKNESS	The thickness of the conductor including all metallic coatings.	
CONDUCTOR TO HOLE SPACING	The distance between the edge of a conductor and the edge of a supported or unsupported hole.	
CONDUCTOR WIDTH	The observable width of the pertinent conductor at any point chosen at random on the printed board, normally viewed from vertically above unless otherwise specified. See also: Design Width of Conductor and Conductor Base Width.	
CONFORMAL COATING	An insulating protective coating which conforms to the configuration of the object coated and is applied on the completed printed board assembly.	
CONNECTOR	A device providing electrical connections/ disconnections. It consists of a mating plug and receptacle which interconnect printed circuit boards with cables, racks, or chassis. Commonly used PC connectors are: edge, two-piece, and hermaphroditic.	
CONNECTOR AREA	The portion of the printed board that is used for providing external (input-output) electrical connections.	
CONTACT	The conducting part of a connector that acts with another such part to complete or break a circuit. Printed wiring contacts include bellows, tuning fork, cantilever, pin and socket, blade and fork, and hermaphroditic contacts.	
CONTACT ALIGNMENT	Defines the overall side play which contacts shall have within the insert cavity to permit self-alignment of mated contacts. Sometimes referred to as amount of contact float.	



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CONTACT AREA	The common area between a conductor and a connector through which the flow of electricity takes place.	
CONTACT BONDING ADHESIVE	An adhesive (particularly of the nonvulcanizing natural rubber type) that bonds to itself on contact although solvent evaporation has left it dry to the touch.	
CONTACT RESISTANCE	The electrical resistance of the metallic surfaces at their interface in the contact area, under specified conditions.	
CONTACT RETENTION	The minimum axial load in either direction which a contact must withstand while remaining firmly fixed in its normal position within the connector insert or housing.	
CONTACT SPACING	The distance between the centerlines of adjacent contact areas.	
CONTAMINANT	An impurity or foreign substance whose presence on printed wiring assemblies can degrade the circuitry by electrical conduction or which can electrolytically, chemically and galvanically corrode the system.	
CONTINUITY	A continuous path for the flow of current in an electrical circuit.	
CONVENTION	A definite formatting method used in electronic diagrams to present the clearest picture of the circuit function. Some common conventions are: 1) circuit signal flow from left to right with inputs on the left and outputs on the right; 2) the various functional stages of the circuit in the same sequence as the signal flow; 3) voltage potentials with the highest voltage at the top of the sheet, and the lowest at the bottom; 4) auxiliary circuits that are included, but are not a main part of the signal flow, such as oscillators and power supplies on the lower half of the drawing.	
COORDINATE TOLERANCING	A method of tolerancing hole locations in which the tolerance is applied directly to linear and angular dimensions, usually forming a rectangular area of allowable variation. Also see: Positional Limitation Tolerancing and True Position Tolerance.	
COPOLYMER	A compound resulting from the chemical reaction of two chemically different monomers with each other.	
COPPER		<b>Cu</b>
COPPER FOIL	A cathode-quality electrolytic copper deposited as a thin, continuous sheet on rotating drums direct from refinery electrolytes. Used as a conductor for printed circuits, copper foil readily bonds to insulating substrates, accepts the printed resists, and etches out to make printed circuits. It is made in a number of weights (thicknesses): the traditional weights are 1 to 3 ounces per square foot, 0.0014 to 0.0042 inch thick.	
CORNER MARKS	The marks at the corners of printed board artwork, the inside edges of which usually locate the borders and establish the contour of the board.	
CORROSIVE FLUXES	Fluxes consisting of inorganic acids and salts; they are generally required where the condition of the surface is well below the ideal for rapid wetting by molten solder. Also called Acid Fluxes.	
COSMETIC DEFECT	A variation from the conventional appearance of an item, such as a slight change in its usual color.	
COUPON	One of the patterns of the quality conformance test circuitry area.	
COVER LAY, COVER LAYER, COVER COAT	Outer layer(s) of insulating material applied over the conductive pattern on the surface of the printed board.	



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CRACKLINE	A condition consisting of breaks in metallic or non metallic coatings or both that extend through to an underlying surface.	
CRAZING	A condition existing in the base material in the form of connected white spots or "crosses" on or below the surface of the base material, reflecting the separation of fibers in the glass cloth and connecting weave intersections.	
CRIMP TERMINAL	A point at which the bared portion of the hook-up wire is crimped to either the contact or a tab or pin which mates with the contact terminal.	
CRIMPER	That part of the crimping die - usually the moving part - which indents or compresses the terminal barrels. Also called Indentor.	
CROSS TALK	Undesirable electrical interference caused by the coupling of energy between signal paths.	
CROSSHATCHING	The breaking of large conductive areas by the use of a pattern of voids in the conductive material.	
CROSS-LINKING	The establishing of chemical links between the molecular chains in polymers. It can be accomplished by chemical reaction, vulcanization, and electron bombardment. The cross-linking in thermosetting resins makes them infusible.	
CROSS-SECTIONAL AREA OF A CONDUCTOR	The sum of the cross-sectional areas of its component wires, that of each wire being measured perpendicular to its individual axis. On printed circuits it is the sum of the cross-sectional areas of all conductive elements of the trace or line.	
CRYSTALLINE MELTING POINT	The temperature at which crystalline structure in a material is broken down.	
C-STAGE	The condition of a resin polymer when it is in the solid state with high molecular weight, being insoluble and infusible.	
CURE	To change the physical properties of a material (usually from a liquid to a solid) by chemical reaction or by the action of heat and catalysts, alone or in combination, with or without pressure.	
CURING AGENT	Synonymous with Hardener.	
CURING TEMPERATURE	The temperature at which a material undergoes a curing process.	
CURING TIME	In the molding of thermosetting plastics, the time in which the material is properly cured.	
CURRENT-CARRYING CAPACITY	The maximum current which can be carried continuously, under specified conditions, by a conductor without causing objectionable degradation of electrical or mechanical properties of the printed board.	
DATUM REFERENCE	A defined point, line, or plane used to locate the pattern or layer of a printed board for manufacturing and/or inspection purposes.	
DEBURRING	Process of removing burrs after PCB drilling. Deburring operations fall into two categories producing a clean, sharp edge when removing heavy burrs, and radiusing the edge of the holes to prevent build-up in plating.	
DEBURRING EQUIPMENT DRY	Apparatus used during the deburring operation of printed circuit board fabrication, and which incorporate variable conveyors and spindle speeds, wheels and/or belts, motor load indicators to record pressure on the board, systems to raise and lower the wheel, and various entrance and exit conveyors. Work width is 24 inches, minimum board length is about 7 to 8 feet. In dry equipment, the PCBs are conveyed under an abrasive wheel, and a collection system to pick up copper dust is required.	



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DEBURRING EQUIPMENT, WET	Units used to achieve deburring and which offer floating type abrasive heads, variable conveyor speeds, spindle motor load indicators, quick-change spindles, water recirculating and filtering systems, and a drying system. The equipment construction must provide a tight seal to prevent water escape, and construction materials should be rust resistant.	
DEFECT	Any non-conformance with the normally accepted characteristics for a unit. Also see: Major Defect and Minor Defect.	
DEFINITION	The fidelity of reproduction of pattern edges, especially in a printed circuit, relative to the original master pattern.	
DELAMINATION	A separation between any of the layers of the base laminate or between the laminate and the metal cladding originating from or extending to the edges of a hole or edge of the board.	
DEMASKING MACHINES FOR PRINTED BOARDS	Tape removers, demasking machines remove the tape from PC boards after chemical processing. They normally demask 400-500 PCBs per hour and are good for moderate to heavy volume producers of boards.	
DEPOSITION	The process of applying a material to a base by means of vacuum electrical, chemical screening or vapor methods.	
DESIGN WIDTH OF CONDUCTOR	The width of a conductor as delineated or noted on the master drawing. See also Conductor Base-Width, Conductor Width, and Current-Carrying Capacity.	
DESOLDERING	Process of disassembling soldered parts in order to repair, replace, inspect or salvage them. Typical desoldering methods are wicking pulse vacuum (solder sucker), heat and pull, and solder extraction.	
DEVICE	An individual electrical element, usually in an independent body, which cannot be further reduced without destroying its stated function.	
DEWETTING	A condition which results when molten solder has coated a surface and then receded, leaving irregularly shaped mounds of solder separated by areas covered with a thin solder film; base metal is not exposed.	
DIE	As used in printed circuitry, a die is the complete tool, consisting of two halves, mating male and female parts. Dies provide a method to pierce all unplated holes and slots and to blank the part outlines at rates unattainable by other methods. Printed circuit dies include pierce, blank, compound and progressive types as well as steel rule, clicker, and hard tool dies.	
DIE PLATE	Usually the lower, female member of a printed circuit die which has an opening or cavity conforming to the outline or shape to be produced.	
DIE SET	A self-contained unit, consisting of an upper punchholder and lower shoe, which holds the die in proper alignment by means of guideposts and bushings.	
DIE STAMPING	Embossing technique used in the mass production of printed circuits to cut out the conductive pattern. This process achieves good registration and line definition. One such technique uses a heated metal-cutting die instead of the platen normally used in laminating and metal-cladding of the base material. The die cuts out the conductive pattern and heats it to activate the heat-reactive adhesive which bonds the metal to the base material.	
DIELECTRIC	(1) Any insulating medium which intervenes between two conductors (2) A material, having the property that energy required to establish an electric field, is recoverable in whole or in part as electric energy.	
DIELECTRIC ABSORPTION	That property of an imperfect dielectric whereby there is an accumulation of electric charges within the body of the material when it is placed in an electric field.	



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DIELECTRIC ANALYSIS	Method of directly monitoring resin cooking, resin staging, and resin curing. Such analysis eliminates many of the variables influencing the selection of a given set of fabrication conditions. Dielectric analyzers consist of a press with heated platens a clamshell autoclave, and a DTA/dielectric cell.	
DIELECTRIC BREAKDOWN	A complete failure of a dielectric material characterized by a disruptive electrical discharge through the material due to a sudden and large increase in voltage.	
DIELECTRIC CONSTANT	The property of a dielectric which determines the electrostatic energy stored per unit volume for a unit potential gradient. Permittivity is the preferred term.	
DIELECTRIC LOSS	The time rate at which electric energy is transformed into heat in a dielectric when it is subjected to a changing electric field.	
DIELECTRIC LOSS ANGLE	The difference between ninety degrees (90) and the dielectric phase angle. Also called Dielectric Phase Difference.	
DIELECTRIC LOSS FACTOR	The product of dielectric constant and the tangent of dielectric loss angle for a material.	
DIELECTRIC LOSS INDEX	The product of a medium's relative permittivity and the tangent of its dielectric loss angle.	
DIELECTRIC PHASE ANGLE	The angular difference in phase between the sinusoidal alternating potential difference applied to a dielectric and the component of the resulting alternating current having the same period as the potential difference.	
DIELECTRIC POWER FACTOR	The cosine of the dielectric phase angle (or sine of the dielectric loss angle).	
DIELECTRIC STRENGTH	The voltage that an insulating material can withstand before breakdown occurs, usually expressed as a voltage gradient (such as volts per mil).	
DIGITIZING	Any method of reducing feature locations on a flat plane to digital representation of X-Y coordinates.	
DIMENSIONAL HOLE	A hole in a printed board where the means of determining location is by coordinate values not necessarily coinciding with the stated grid.	
DIMENSIONAL STABILITY	Degree of freedom from distortion by such factors as temperature changes, humidity changes, age, handling, and stress.	
DIP SOLDERING	A process whereby printed boards are brought in contact with the surface of a static pool of molten solder for the purpose of soldering the entire exposed conductive pattern in one operation.	
DIRECT MEMORY ACCESS	(1) Abbreviated DMA. In a computer, a method of gaining direct access to main storage to achieve data transfer without involving the CPU. The manner in which the CPU is disabled while DMA is in progress differs in different models and some use several methods to accomplish DMA. (2) A mechanism that allows an input/output device to take control of the CPU for one or more memory cycles in order to write into memory or read from memory. The order of executing the program steps (instructions) remains unchanged.	<b>DMA</b>
DISRUPTIVE GRADIENT	Synonymous with Dielectric Strength and Electrical Strength.	



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DISSIPATION FACTOR	<p>A measure of the alternating current loss. Dissipation factor is proportional to the power loss per cycle (f) per potential gradient (E) (squared) per unit volume as follows:</p> $\text{Diss Fac.} = \frac{\text{power loss}}{(E)^2 \times f \times \text{volume} \times \text{constant}}$	
DOCUMENTATION	<p>Information accompanying a printed circuit board which explains the basic electromechanical design concept, the type and quantity of parts and materials required, special manufacturing instructions, and up-to-date revisions. Three classifications of printed wiring documentation are:</p> <ol style="list-style-type: none"> <li>1. Minimum - used for prototype and small quantity runs.</li> <li>2. Formal - used for standard product line and/or production quantities.</li> <li>3. Military - complies with government contracts specifying procurement drawings for the manufacture of identical items by other than the original manufacturer.</li> </ol>	
DOUBLE-DIFFUSED METAL OXIDE SEMICONDUCTOR	<p>A process where n and p atoms are diffused through the same mask opening to give precise-sized narrow channels. Used on discrete field-effect transistors (not MOS ICs) for ultra-high gains and frequency performance. Its use of a larger area of active silicon makes it not too promising for MOS ICs.</p>	<b>DMOS</b>
DOUBLE-SIDED BOARD	<p>A printed wiring board having conductor patterns on both sides. Usually interconnections between conductive paths on both sides are created by drilling or punching holes through coincident conductors and plating copper on the walls of the holes, thereby creating plated through holes.</p>	
DRAFTING SUPPLIES	<p>Printed circuit drafting supplies start with the drafting papers and films. Generally, these should exhibit a high degree of stability under changing heat and humidity conditions. Anti-static qualities also are important. Drafting film or paper with non-reproducible and non-erasable grid lines speeds and facilitates layouts. Shapes and patterns which can be cut out and pressed into place include patterns for "TO" cans, dual-in-line and flat packs, pads, connector patterns, symbols, letters, numbers, elbows, conductor tees, fillets, targets, etc. Precision slit tapes are used for conductor runs.</p>	
DRAG SOLDERING	<p>A process whereby supported, moving printed circuit assemblies or printed wiring assemblies are brought in contact with the surface of a static pool of molten solder.</p>	
DRILL FACET	<p>The surface formed by the primary and secondary relief angles of a drill tip.</p>	
DRILLING BACKUP BOARDS	<p>Usually disposable support materials which assist in the drilling of printed circuit boards, reduce drill exit burrs, and allow the drill to clear the laminate being drilled by acting as fillers to protect the table surfaces of the drilling equipment.</p>	
DRILLING ENTRY MATERIALS	<p>Thin, disposable, protective materials employed to reduce mars and/or scratches on the surfaces of the material being drilled. Entry materials also reduce drifting or drill deflections caused by the glass cloth warp profile unevenness.</p>	



Term	Definition	Ellipsis
DRILLING MACHINES	Equipment used in printed circuit board drilling operations. The two basic types are:  1. Manual Machines, positioned by a template, can be single spindle or multiple spindle, and are usually limited to four spindles capable of satisfying the prototype and short run segment of the printed circuit board market. They average 35 to 45 hits per minute with accuracies in the range of 0.001 inch to 0.003 inch of template position.  2. Numerically Controlled Machines are capable of 200 plus hits per minute with table positions and repeatabilities of 0.0002 inch to 0.0005 inch. They are designed for high production and extreme accuracies, and are more versatile than manual machines.	
DRILLS, CIRCUIT BOARD	Solid carbide end cutting tools with four facet points and two helical flutes designed specifically for the fast removal of chips in extremely abrasive, glass epoxy materials. "Shank" drills are furnished with 1/2 inch diameter shanks for all drill sizes, while drill body and shank share the same diameter in "straight shank" drills.	
DROSS	Oxide and other contaminants which form on the surface of molten solder.	
DRY CIRCUIT	A circuit where current and voltage is so low that there is no arcing to roughen the contacts. As a result an insulating film can develop that prevents closing of the circuit when contacts are brought together, if the proper means are not employed to prevent the initial formation of the film.	
DRY FILM RESISTS	Coating materials specifically designed for use in the manufacture of printed circuit boards and chemically machined parts. They are suitable for all photo mechanical operations and are resistant to various electroplating and etching processes.	
DUAL IN-LINE PACKAGE	(1) A component which terminates in two straight rows of pins of lead wires. (2) A type of housing for integrated circuits. The standard form is a molded plastic container about 3/4 inch long and 1/3 inch wide with two rows of pins spaced 0.1 inch between centers.	<b>DIP</b>
DUMMY	A cathode with a large area used in a low-current-density plating operation for the removal of metallic impurities from solution. The process is called "dummying."	
DUMMYING	The process of removing metallic impurities from plating solution with a large area, dummy cathode.	
E GLASS	A low alkali lime alumina borosilicate glass, noted for its good electrical properties.	
EDGE CONNECTOR	A one-piece receptacle, containing female contacts, designed to receive the edge of a printed circuit board interconnect on which the male contacts are etched or printed. The connector may contain either a single or double row of female contacts. Both thermoplastic and thermosetting insulating materials are used.	
EDGE DEFINITION	The fidelity of reproduction of a pattern edge relative to the production master.	
EDGE DIP SOLDERABILITY TEST	The oldest solderability test; it is performed by taking a specially prepared specimen, fluxing it with a non-activated rosin flux, and then immersing it into a pot of molten solder at a pre-determined rate of immersion for a pre-determined dwell and then withdrawing at a pre-determined rate. This can be done very crudely by a hand operation or with a cam controlled piece of equipment. The determination of solderability is then made by comparing against specially prepared standards.	



Term	Definition	Ellipsis
EDGE SPACING	The distance of a pattern, components, or both, from the edges of the printed board. See also Margin.	
EDGE-BOARD CONTACTS	A series of contacts printed on or near an edge of a printed board and intended for mating with a one-part edge connector.	
ELASTOMER	A material which at room temperature stretches under low stress to at least twice its length but snaps back to its original length upon release of the stress. Rubber is a natural elastomer.	
ELECTRIC OVENS	Units used for drying, curing and preheating. There are two types.  1. In gravity convection ovens, chamber air moves upward solely by gravity. When heating elements are energized, air is drawn into the work chamber, heats, rises, and expands.  2. In mechanical convection ovens, a motor/blower forces heated air inside the work chamber through a definite, prescribed air-flow pattern.	
ELECTRIC STRENGTH	The maximum potential gradient that a material can withstand without rupture. It is a function of the thickness of the material and the method and conditions of test. Also called Dielectric Strength or Disruptive Gradient.	
ELECTROLESS DEPOSITION	(1) A method of metal deposition by means of a chemical reducing agent present in the processing solution. The process is further characterized by the catalytic nature of the surface which enables the metal to be plated to any thickness. (2) The deposition of conductive material from an autocatalytic plating solution without application of electrical current.	
ELECTROLESS PLATING	The controlled autocatalytic reduction of a metal ion on certain catalytic surfaces.	
ELECTRON BEAM ADDRESSABLE MEMORY		<b>EBAM</b>
ELECTROPLATING	The electrodeposition of an adherent metal coating on a conductive object for protection, decoration, or other purposes. The object to be plated is placed in an electrolyte and connected to one terminal of a direct current voltage source. The metal to be deposited is similarly immersed and connected to the other terminals. Ions of the metal provide transfer to metal as they make up the current flow between electrodes.	
ELECTROTINNING	Electroplating tin on an object.	
ELEMENT	(1) A substance composed entirely of atoms of the same atomic number, e.g., aluminum or copper. (2) A part of an integrated circuit which contributes directly to its electrical characteristics. An active element exhibits gain, as a transistor; a passive element does not have gain, such as a resistor or capacitor.	
EMULSION SIDE	The side of the film or glass on which the photographic image is present.	
ENCAPSULATING	Enclosing an article in a closed envelope of plastic.	
ENTRAPMENT	The damaging admission and trapping of air, flux, and fumes, it is caused by contamination and plating.	
EPOXY	A family of thermosetting resins used in the packaging of semiconductor devices. Epoxies form a chemical bond to many metal surfaces.	



Term	Definition	Ellipsis
EPOXY RESINS	Chemical compounds bearing two or more epoxide (or oxirane) groups per molecule. Both low-pressure and high-pressure laminates are made with epoxy resins. Glass-cloth-base sheets, rods, and tubes are available. Both paper base and glass cloth sheets are produced with or without copper cladding. Self-extinguishing paper base laminates are replacing phenolic laminates in some electronic applications, and both paper and glass cloth laminates are used for printed wiring boards.	
EPOXY SMEAR	Epoxy resin which has been deposited on edges of copper in holes during drilling either as a uniform coating or as scattered patches. It is undesirable because it can electrically isolate the conductive layers from the plated-through-hole interconnections.	
ETCH FACTOR	The ratio of the depth of etch (conductor thickness) to the amount of lateral etch (undercut).	
ETCHANT	A solution used to remove, by chemical reaction, the unwanted portion of material from a printed board.	
ETCHBACK	The controlled removal of all of the components of the base material by a chemical process acting on the sidewalls of plated-through holes to expose additional internal conductor areas.	
ETCHED PRINTED BOARD	A board having a conductive pattern formed by the chemical removal of unwanted portions of the conductive foil.	
ETCHING	The process of removing unwanted metallic substance (bonded to a base) via chemical or chemical and electrolytic means.	
ETCHING EQUIPMENT	A wide variety of devices is used in the etching operations of printed circuit production. Spray etching equipment handles work areas of a couple square inches to 15 square inches with sump capacities ranging from 5 to 25 gallons. Batch-type etching equipment handles work sizes up to 24 square inches with sump capacities of 15 to 70 gallons, it is used for low volume production. Conveyorized etchers may be small for low volume production prototype work, and pilot plant operation, or large conveyorized units with sump capacities between 70 and 140 gallons.	
ETCHING INDICATOR	A wedge shaped or other specified pattern affixed to the conductive foil to indicate the quality of etching.	
ETCHING RESISTS	<p>Materials deposited on the surface of a copper-clad base material that prevent the removal by etching of the conductive areas they cover. There are two basic trends in the area of etching resists for printed circuits.</p> <ol style="list-style-type: none"> <li data-bbox="516 1486 1304 1598">1. One is the industry trend toward a "systems" approach rather than considering only the chemical products. This means the matching of equipment and chemicals into an integrated etching, rinsing, and etch ink removal system.</li> <li data-bbox="516 1627 1352 1738">2. The second trend is the use of the alkaline soluble (removable in alkaline solutions) etching inks, not only for ease of use, but to permit low cost treatment of effluent remover baths and the elimination of air pollution and the high costs of organic solvents.</li> </ol>	
ETHYLENECHLOROTRIFLUORO ETHYLENE	A fluoropolymer film used in printed circuits; it offers a good combination of abrasion resistance, high tensile strength, and low specific gravity.	<b>ECTFE</b>



Term	Definition	Ellipsis
EUTECTIC	(1) An isothermal reversible reaction in which a liquid is converted into two or more intimately mixed solids on cooling, the number of solids formed being the same as the number of components in the system. (2) An alloy having the composition indicated by the eutectic point on an equilibrium diagram. (3) An alloy structure of intermixed solid constituents formed by a eutectic reaction.	
EXOTHERM	A characteristic curve which shows heat of reaction of a resin during cure (temperature vs time). The peak exotherm is the maximum temperature on the curve.	
EXOTHERMIC REACTION	A chemical reaction in which heat is given off.	
EXPOSURE OPERATION	The process of illuminating the photoresist coated circuit board to light of the correct intensity and spectral make-up, for the correct period of time needed to cause hardening (polymerization) of the resist. Only specific areas of the resist are exposed as delineated by an opaque shadow mask (artwork) held in intimate contact with the resist surface.	
EXTRANEIOUS COPPER	Unwanted copper remaining on the base material after chemical processing.	
EYELETS	Hollow tubes inserted in terminal or printed boards to provide mechanical support for component leads or electrical connection. In addition to their ability to be assembled by high speed equipment, they are relatively inexpensive, are available in a wide range of materials including zinc, aluminum, copper, steel, and stainless steel, and are available in a variety of shapes. These factors must be kept in mind when designing eyelets into an assembly; the assembly must be capable of being inserted into the eyeletting machine, and the assembly must be accessible from both sides. Designed for miniaturization, eyelets are available with specific diameters and lengths for single and double sided PC boards. Twin or triple eyelets with a common flange can be used for jump connection between terminals.	
FABRICATION CHEMICALS	Products and compounds used in the fabrication of bare printed circuit boards including chemicals used for cleaning, plating, coating, stripping, conditioning, and solder fusing operations. In addition to generating the bare printed circuit board, some of these operations are significant in determining the ultimate solderability of the bare board.	
FARAD	Unit of capacitance. The capacitance of a capacitor which, when charged with one coulomb, gives a difference of potential of one volt. The farad is the unit of capacitance in the mksa systems.	<b>F</b>
FEED-THRU INSULATORS AND TERMINALS	Fabricated from dielectric materials, feed-thru insulators are used to carry a metal conductor through the chassis while preventing the "hot"lead from shorting to the ground chassis. A wide variety of configurations are available for both ends of the feed-thru lug. They can be straight, bifurcated, wire-wrappable, turreted, etc.	
FIBER EXPOSURE	A condition in which glass cloth fibers are exposed on machined or abraded areas.	
FILLER	A material, usually inert, added to a plastic to reduce cost or modify physical properties.	
FILLET	A radius (curvature) imparted to inside meeting surfaces.	
FILM ADHESIVE	A thin layer of dried adhesive. Also, a class of adhesives provided in dry film form with or without reinforcing fabric and cured by heat and pressure.	



Term	Definition	Ellipsis
FILTERS	Filtration media that remove solids and organic impurities from plating solutions, water, photo resists, and anodizing solutions and cleaners. Particle retention, or surface filtration, is achieved with cellulose or asbestos pads, paper, cloth, and screen. Wound filter cartridges consist of 20 layers of yarn wound in such a way that diamond openings become larger and larger with each layer. Thus. When liquid flows from the outside in, the larger particles are retained first. Other cartridges include pleated wire cloth, porous stainless steel, pleated melamine impregnated paper and glass fiber, pleated cellulose, and sleeve type (woven sleeve over support mesh and support column). Carbon is used to remove organics.	
FINGERS	Nonpreferred term for Edge-Board Contacts.	
FIRST ARTICLE	A sample part or assembly manufactured prior to the start of production for the purpose of assuring that the manufacturer is capable of manufacturing a product which will meet the requirements.	
FIXTURE	A device that provides the actuating mechanism to press the product to be tested into the spring contact probe test pattern. It contains either a dedicated head or an interface for interchangeable test heads and a means of locating the product to be tested. Also called Handler, Adaptor, and Bed-of-Nails.	
FLANGE	A projection extending from (or around the periphery of) a connector, and having holes that provide for mounting the connector to a panel, or to another mating connector half.	
FLAT CABLE	A cable with two or more parallel, round or flat conductors in the same plane, encapsulated by an insulating material.	
FLEXIBLE PRINTED CIRCUIT	A random arrangement of printed wiring and components utilizing flexible base materials with or without flexible cover layers. Also called Flexible Printed Wiring.	
FLEXIBLE SUBSTRATE	Thick and thin film circuits have generally been deposited on rigid substrates, but it is possible to deposit these circuits on some plastic substrates.	
FLEXURAL MODULUS	The ratio, within the elastic limit, of stress to corresponding strain. It is calculated by drawing a tangent to the steepest initial straight-line portion of the load-deformation curve and calculating by the equation $E_b = \frac{L^3(m)}{4bd^3}$ , where $E_b$ is the modulus, $L$ is the span in inches, $b$ is the width of beam tested, $d$ is the depth of the beam, and $m$ is the slope of the tangent.	
FLEXURAL STRENGTH	(1) The strength of a material subjected to bending. It is expressed as the tensile stress of the outermost fibers of a bent test sample at the instant of failure. (2) The minimum non-moving load required to break a specimen supported at two points with the load applied at the midpoint between the supports.	
	It is expressed as pounds breaking force per square inch of cross section of the specimen. Flexural strength is one of the principle mechanical properties specified for laminates used to make printed wiring boards.	
FLEXURE FAILURE	A conductor failure due to repeated flexing which is indicated by an increase of resistance to a specified value for a specified time.	
FLOW SOLDERING	Nonpreferred term for Wave Soldering.	



Term	Definition	Ellipsis
FLUORINATED ETHYLENE PROPYLENE FILM	A transparent, flexible film providing excellent dielectric characteristics at high temperatures. Since metals can be bonded to the film without the use of adhesives, a cover sheet of film can be heat-bonded to completely encapsulate the printed circuit network. By wrapping and fusing, very thin layers of the film can be applied to wire, braids, or metallic shields. The electrical characteristics, coupled with the pinhole-free nature of this dielectric, recommend its use in capacitor applications.	<b>FEP</b>
FLUOROCARBON	An organic compound having fluorine atoms in its chemical structure, an inclusion that usually lends stability to plastics. Teflon is a fluorocarbon.	
FLUSH CONDUCTOR	A conductor whose outer surface is in the same plane as the surface of the insulating material adjacent to the conductor.	
FLUX	A substance used to promote or facilitate fusion, such as a material used to remove oxides from surfaces to be joined by soldering or welding. See Solder Flux, Organic Water Soluble Flux, Rosin Flux, Corrosive Fluxes, and Intermediate Fluxes.	
FOAM FLUXING	A commonly used wave solder fluxing method in which flux foam is generated from a liquid flux by means of a porous "diffuser", such as a hollow cylindrical stone. Low compressed air forced through the pores of the stone, immersed in the flux, generates fine bubbles of foam which are guided to the surface by a chimney nozzle. Also see: Brush fluxing, Wave fluxing, and Spray fluxing.	
FOIL	A thin, continuous sheet of metal usually copper or aluminum, used as the conductor for printed circuits. Foils used for printed circuits are commonly 1 or 2 ounces per square foot, the thinner the foil, the lower the required etch time. Thinner foils also permit finer definition and spacing. See Copper Foil.	
FOOTPRINT METHOD	A technique used to test production volume printed circuit boards. Fault is determined by observing the output pattern at the connector. To prepare for diagnosing a particular board, a record (dictionary) of the output pattern produced for every fault is made. The pattern can be deduced by modeling or through circuit analysis.	
FROM-TO LIST	Written wiring instructions in the form of a list indicating termination points.	
FULLY-ADDITIVE PROCESS	An additive process wherein the entire thickness of electrically isolated conductors is built up by electroless metal deposition. Synonymous with Fully Electroless.	
FUSED COATING	A metallic coating (usually tin or solder alloy) which has been melted and solidified forming a metallurgical bond to the base material.	
FUSING	The melting of a metallic coating (usually electrodeposited) followed by solidification.	
GEL	(1) The soft, rubbery mass that is formed as a thermosetting resin goes from a fluid to an infusible solid. It is an intermediate state in a curing reaction, and a stage in which the resin is mechanically very weak. (2) A semi-solid system consisting of a solid held in a liquid.	
GEL POINT	The point at which gelation begins.	
GEL TIME	The time expressed in seconds required for a resin to change its physical state from a solid through a liquid to a solid again due to the action of thermal input.	
GLASS TRANSITION POINT	The temperature at which a material loses properties and becomes a semiliquid.	



Term	Definition	Ellipsis
GLASS TRANSITION TEMPERATURE	(1) The temperature at which epoxy, for example, softens and begins to expand independently of the glass fabric expansion rate. (2) The temperature at which an amorphous polymer (or the amorphous regions in a partially crystalline polymer) changes from a hard and relatively brittle condition to a viscous or rubbery condition.  This transition generally occurs over a relatively narrow temperature range; it is not a phase transition. In this temperature region, many physical properties undergo significant rapid changes. Some of those properties are hardness, brittleness, thermal expansivity, and specific heat.	
GLOBULE TEST	A solderability test which is specifically for component leads. The time required for a globule of solder to completely wet around a component lead is measured and recorded and then compared against a known standard. This particular test requires a certain amount of human evaluation.	
GLUE-LINE THICKNESS	Thickness of the fully dried adhesive layer.	
GOLD		<b>Au</b>
GRADED WEDGE	See Etching Indicator.	
GRAPHIC SYMBOL	An electronic circuit diagram symbol formed using one or more basic elements such as lines, circles, arcs, and squares. The meaning of a symbol is not changed by its orientation, although some symbols are generally shown in one direction by convention. Line width and symbol size do not affect a graphic symbol's meaning.	
GRID	An orthogonal network of two sets of parallel equidistant lines used for locating points or positioning a feature on a printed board. Connections should be located on the crosspoints of the gridlines. The position of conductors may be independent of the grid, i.e., not necessarily following the gridlines.	
GROUND PLANE	(1) A conducting surface used as a common reference point for circuit returns, shielding, or heat sinking. (2) A conductor layer, or portion of a conductor layer, used as a common reference point for circuit returns, shielding, or heat sinking.	
GROUND PLANE CLEARANCE	A clearance hole in a ground plane.	
GUIDE	See Card Guide.	
GUIDE PIN	A pin or rod extending beyond the mating face of a two-piece connector and designed to guide the closing or assembly of the connector to assure proper mating of contacts, and to prevent damage to these contacts caused by mismating of the connector halves.	
GUIDED PROBE METHOD	A technique used to test production volume printed circuit boards. It is based on the theory that proper incoming inspection will catch the majority of device failures, and that through inspection of the printed circuit board prior to loading will eliminate most manufacturing errors. See "Internal Trace" Technique.	
HALOING	Mechanically-induced fracturing delamination on or below the surface of the base material; it is usually exhibited by a light area around holes, other machined areas, or both.	
HARD TOOL DIE	A die used in flexible circuitry when volume is high or tolerances needed are under +/- .010 inch. This die eliminates burrs and stringers on the part edge.	



Term	Definition	Ellipsis
HARDENER	A chemical added to a thermosetting resin for the purpose of causing curing or hardening. A hardener, such as an amine or acid anhydride for an epoxy resin, is a part of the chemical reaction and a part of the chemical composition of the cured resin. The terms "hardener" and "curing agent" are used interchangeably.	
HEAT AND PULL	Desoldering method utilizing a soldering iron with a shaped heater block attached, a molten solder "solder pot" or solder fountain, or a device which grasps, heats, and then pulls the leads of the component to be removed. First the leads and solder are heated to obtain melt, then, the component is pulled out.	
HEAT SEALING	A method of joining plastic films by simultaneous application of heat and pressure to areas in contact. The heat may be supplied conductively or dielectrically.	
HEAT SINKING PLANE	A continuous sheet of metal on or in a printed board that functions to dissipate heat away from heat sensitive components.	
HEAT SINKS	Devices used to absorb and/or transfer heat away from heat sensitive parts. Generally made from aluminum to achieve high heat conductivity and light weight, most are of one-piece construction. They may be designed for mounting on printed circuit boards.	
HEAT SOAK	Heating a circuit over a period of time to allow all parts of the package and circuit to stabilize at the same temperature.	
HERMAPHRODITIC CONNECTOR	An interconnecting device in which both mating parts are identical at their mating surfaces. Also called Sexless Connector.	
HI REL	High reliability device designed to extremely tight tolerances and long service life. It must meet high quality control levels.	
HIGH ENERGY SURFACE	A hard solid with high melting point including metals, metal oxides, nitrides, and glasses that are arbitrarily defined as having surface free energies in the range 5000-500 ergs cm <sup>2</sup> . High energy surfaces are one extreme of specific surface free energy of solids considered in wetting processes. See Low Energy Surface.	
HOLE BREAKOUT	A condition in which a hole is not completely surrounded by the land.	
HOLE DENSITY	The quantity of holes in a printed board per unit area.	
HOLE LOCATION	The dimensional location of the center of a hole.	
HOLE PATTERN	The arrangement of all holes in a printed board.	
HOLE PREPARATION	The hole prior to plating shall be clean cut and free of burrs, loose or hanging fibers, copper dust and resin dust.	
HOLE PULL STRENGTH	The force, in pounds, necessary to rupture a plated-through hole or its surface terminal pads when loaded or pulled in the direction of the axis of the hole. The pull is usually applied to a wire soldered in the hole, and the rate of pull is given in inches per minute.	
HOLE VOID	A void in the metallic deposit of a plated-through hole exposing the base material.	
HOT AIR SOLDER LEVELED	A process used to deposit a solder coating on the exposed copper surfaces. A panel containing the circuits is immersed in a molten bath of solder, extracted through hot air 'knives' which remove the excess solder.	<b>HASL</b>



Term	Definition	Ellipsis
HOT-MELT ADHESIVE	A thermoplastic adhesive compound, usually solid at room temperature, which is heated to fluid state for applications.	
HYDROCARBON	An organic compound containing only carbon and hydrogen atoms in its chemical structure.	
HYDROLYSIS	The chemical decomposition of a substance involving the addition of water.	
HYGROSCOPIC	Tending to absorb moisture.	
ICICLE	Nonpreferred term for Solder Projection.	
IMMERSION PLATING (GALVANIC DISPLACEMENT)	The chemical deposition of a thin metallic coating over certain base metals by a partial displacement of the base metal.	
IMPEDANCE	The total opposition that a circuit offers to the flow of alternating current or any other varying current at a particular frequency. The combination of resistance (R) and reactance (X), measured in ohms: $Z=E/I=\text{square root of } (R^2 + E^2)$ .	<b>Z</b>
IMPEDANCE MATCH	The condition in which the impedance of a component or circuit is equal to the internal impedance of the source, or the surge impedance of a transmission line, thereby giving maximum transfer of energy from source to load, minimum reflection, and minimum distortion.	
IMPREGNATE	To fill the voids and interstices of a material with a compound. This does not imply complete fill or complete coating of the surfaces by a hole-free film.	
INCLUSION	A foreign particle in the conductive layer, plating, or base material.	
INDENTATION	See Pit.	
INDEXING HOLE	A physical feature, especially in a printed circuit board, or in the web used as a guide in processing and fabrication. Sometimes called Index Edge, Index Edge Marker, Indexing Notch, Indexing Slot. See Locating Edge, Locating Edge Marker, etc.	
INDUCTANCE	The property of a circuit or circuit element that opposes a change in current flow, causing current changes to lag behind voltage changes. It is measured in henrys.	<b>L</b>
INDUCTION	The simplest and oldest method of neutralizing static electricity. Induction equipment, such as tinsel with a metal core, must be well grounded electrically, stretched tight, and placed 1/4 of an inch from the material to be neutralized. There must be free air space under the material to be neutralized so that static is reduced on both sides of the laden material. Any induction device will never reduce static electricity to the zero potential level, because a threshold or beginning voltage is required to start the process.	
INFRARED	Part of the electromagnetic spectrum between the visible light range and the radar range.	<b>IR</b>
INFRARED OVENS	Units that dry, cure, and preheat parts directly (i.e. without heating the oven air) via infrared energy.	
INHIBITOR	A chemical that is added to a resin to slow down the curing reaction and is normally added to prolong the storage life of a thermosetting resin.	
INITIATING	See Activating.	



Term	Definition	Ellipsis
INK	One of several conductive materials used for chip bonding, electrostatic shielding, corona shielding, making connections, repairing of printed circuits, attaching leads, adhesive work, ignition cable sheath coating and making electrodes, contacts terminations, surfaces receptive to plating, etc.	
INORGANIC CHEMICALS	Chemicals whose molecular instructures are based on other than carbon atoms.	
INSERTION EQUIPMENT	See Component Insertion Equipment.	
INSERTION FORCE	The effort, usually measured in ounces, required to engage mating components.	
INSPECTION LOT	A collection of units of product bearing identification and treated as a unique entity from which a sample is to be drawn and inspected to determine conformance with the acceptability criteria.	
INSPECTION OVERLAY	A positive or negative transparency made from the production master and used as an inspection aid.	
INSULATION RESISTANCE	The electrical resistance of the insulating material (determined under specified conditions) between any pair of contacts, conductors, or grounding devices in various combinations.	
INTERNAL LAYER	A conductive pattern contained entirely within a multilayer board.	
JUMPER	An electrical connection between two points on a printed board added after the intended conductive pattern is formed.	
LAMINATE VOID	Absence of epoxy resin in any cross-sectional area which should normally contain epoxy resin.	
LAND	A portion of a conductive pattern usually, but not exclusively, used for the connection and/or attachment of components. Also called Pad, Boss, Terminal Point, Blivet, Tab, Spot, or Donut.	
LANDLESS HOLE	A plated-through hole without a land(s).	
LARGE-SCALE INTEGRATION	Intergrated circuit of high complexity, usually consisting of more than 100 gates and frequently containing more than 1,000 circuit elements.	<b>LSI</b>
LAYER-TO-LAYER SPACING	The thickness of dielectric material between adjacent layers of conductive circuitry in a multilayer printed board.	
LAY-UP	The process of registering and stacking layers of a multilayer board in preparation for the laminating cycle.	
LEAD		<b>Pb</b>
LEGEND	A format of lettering or symbols on the printed board, e.g., part number component locations, or patterns.	
LINEAR INTEGRATED CIRCUIT	Analog circuit in which the output faithfully reproduces an input signal. Most modern circuits are much more complicated than this and generally have either an analog input or an analog output, while the rest of the circuit may be either in analog or digital. Most linear circuits operate at higher voltage than digital circuits. Refers to either die form or packaged device.	<b>LIC</b>



Term	Definition	Ellipsis
LOGIC CIRCUIT, LOGIC IC	<p>Logic circuit is a subclass of digital circuits; it does not include microprocessors with data buses or memory circuits. Internal data is contained in the form of discrete units, unlike analog circuits where the data is continuously variable. There are three major logic families in current use:</p> <ol style="list-style-type: none"><li>1. TTL - logic systems which evolved from DTL, wherein the multiple diode input cluster is replaced by a multiple emitter transistor. The term is commonly applied to any circuit which has a multiple emitter input and an active pull-up network on the output. □</li><li>2. ECL - logic in which transistors operate in the nonsaturated mode, as distinguished from most other logic types which operate in the saturating region. This logic has very high switching speed and very low voltage swings. It is also called CML or current mode logic. It appears from a negative supply rather than the normal positive supply of all the other logic types. □</li><li>3. IIL - logic in which a gate consists of only one NPN-PNP transistor combination, with multiple isolated outputs rather than multiple isolated inputs.</li></ol>	
MAJOR WEAVE DIRECTION	The continuous-length direction of a roll of woven glass fabric.	
MASTER DRAWING	A document that shows the dimensional limits or grid locations applicable to any or all parts of a printed wiring or printed circuit base. It includes the arrangement of conductive or nonconductive patterns or elements, size, type, and location of holes, and any other information necessary to characterize the complete fabricated product.	
MEASLING	Discrete white spots or crosses below the surface of the base laminate that reflect a separation of fibers in the glass cloth at the weave intersection.	
MEDIUM SCALE INTEGRATION	Monolithic integration of circuits of approximately 10 to 100 gates; up to 2048 bits.	<b>MSI</b>



Term	Definition	Ellipsis
MEMORY CIRCUIT, MEMORY IC	<p>Integrated circuit that possesses storage capacity. It may be RWM (RAM), ROM, PROM, EAROM, serial memory type, or CCD. The three major memory types are:</p> <ol style="list-style-type: none"> <li>1. Read-only memory (ROM) - ROMs are used where information is to be stored on a permanent basis and used repetitively. Such storage is useful for tables of data or instructions that remain fixed and is usually randomly accessed. A ROM does not accept write cycles during normal operation. The information may be mechanically or electrically inserted into the memory and permanently stored. In read-mostly memory (RMM), the information may be inserted electrically, optically, or thermally prior to use and then altered before the next program is run. A programmable read-only memory (PROM) can be reprogrammed repeatedly, but not as a normal operating feature of the system. □</li> <li>2. Read/write memory (RWM) - RWMs are used where information is to be stored on a temporary basis so that it is readily accessible in a short period of time. In RWMs the data can be changed at will by the system. Read/write memories are usually in the form of random access memory (RAM), which allows storage of and access to data in any sequence or arrangement of individual bits of data as governed by the memory control program. A RAM is organized such that any individual cell can be specifically and immediately (within the access time) accessed and data can be continuously written into and out of the cell. □</li> <li>3. Shift register (SR) - Shift registers are used where information is to be stored in sequential order and where fast access is not required. Such storage is useful in computing and calculating equipment and various other applications. Shift registers are a special form of serial access memory, such as charge-coupled devices (CCD), in which information is stored in a time sequence with the data location determined by a time slot in the system timing cycle requiring the system to wait until the slot becomes available.</li> </ol> <p>Nonsemiconductor memory is primarily magnetic and includes magnetic bubble memory, magnetic core memory, plated wire memory, magnetic tape, magnetic disk, E-beam addressable, and laser scan.</p>	
METAL OXIDE SEMICONDUCTOR	<p>Semiconductor technology that employs metal oxide semiconductor (MOS) transistors as the main active circuit element. MOS circuits offer high density, low power consumption, low cost per function, and usually require simpler fabrication processes than bipolar circuits, and are normally slower. Distinction is made between N-channel (NMOS) and P-channel (PMOS) devices, with N-channel devices being faster than P-channel devices of the same dimensions, or smaller than P-channel devices of the same speed. The combination of NMOS and PMOS devices leads to CMOS circuits.</p>	<b>MOS</b>
MICROPROCESSING UNIT	<p>The control and processing portion of a small computer or microcomputer, that can be built with LSI MOS circuitry usually on one chip. Like all computer processors, microprocessors can handle both arithmetic and logic data in a bit-parallel fashion under control of a program.</p>	<b>MPU</b>
MICROSTRIP	<p>A type of transmission line configuration which consists of a conductor over a parallel ground plane separated by a dielectric.</p>	
MINOR WEAVE DIRECTION	<p>The width direction of a roll of woven glass fabric.</p>	
MODULUS OF ELASTICITY	<p>The ratio of stress to strain in a material that is elastically deformed.</p>	
MOISTURE RESISTANCE	<p>The ability of a material not to absorb moisture either from air or when immersed in water.</p>	



Term	Definition	Ellipsis
MOUNTING HOLE	A hole used for the mechanical mounting of a printed board or for the mechanical attachment of components to a printed board.	
MULTILAYER BOARD	A product consisting of layers of electrical conductors separated from each other by insulating supports and fabricated into a solid mass. Innerlayer connections are used to establish continuity between various conductor patterns.	
MULTIPLE-IMAGE PRODUCTION MASTER	A production master used to produce two or more products simultaneously.	
NAIL HEADING	The flared condition of copper on the inner conductor layers of a multilayer board caused by hole drilling.	
N-CHANNEL METAL OXIDE SEMICONDUCTOR	Pertaining to MOS devices made on p-type silicon substrates in which the active carriers are electrons that flow between n-type source and drain contacts. NMOS is from two to three times faster than PMOS.	<b>NMOS</b>
NEMA STANDARDS	Property values adopted as standard by the National Electrical Manufacturers Association.	
NICKEL		<b>Ni</b>
NOBLE ELEMENTS	Elements that either do not oxidize or oxidize with difficulty; examples are gold and platinum.	
NON-PLATED THROUGH HOLE		<b>NPTH</b>
ORGANIC	Composed of matter originating in plant or animal life or composed of chemicals of hydrocarbon origin, either natural or synthetic.	
ORIGINAL EQUIPMENT MANUFACTURER (CONSUMPTION)	Components used in US-produced equipment.	<b>OEM</b>
P-CHANNEL METAL OXIDE SEMICONDUCTOR	MOS devices made on an n-type silicon substrate in which the active carriers are holes (p) flowing between p-type source and drain contacts.	<b>PMOS</b>
PERIPHERAL DEVICE	Any input/output equipment attached to a computer; for example, teletype units, card reader, display, etc.; in a microprocessing unit, circuits other than other than the microprocessor itself; for example, clock, I/O circuits, and so forth. Since each peripheral device in a computer has its own way of transmitting and/or receiving data from the computer, in order to make input/output work, hardware device controllers must be built to act as interface between the computer hardware and each peripheral device. All peripheral devices interface to an input/output bus.	
PERMANENT MASK	A resist which is not removed after processing, e.g. plating resist used in a fully-additive process.	
PH	A measure of the acid or alkaline condition of a solution. A pH of 7 is neutral (distilled water); pH values below 7 are increasingly acid as pH values go toward 0; and pH values above 7 are increasingly alkaline as pH values go toward the maximum value of 14.	
PHASE-LOCK LOOP	A communications circuit in which a local oscillator is synchronized in phase and frequency with a received signal.	<b>PLL</b>
PHOTOGRAPHIC REDUCTION DIMENSION	The dimensions (e.g., line or distance between two specified points) on the artwork master to indicate the extent to which the artwork master is to be photographically reduced. The value of the dimension refers to the 1:1 scale and must be specified.	



Term	Definition	Ellipsis
PHOTOMASTER	An accurately scaled copy of the artwork master used in the photofabrication cycle to facilitate photoprocessing steps.	
PHOTOPOLYMER	A polymer that changes characteristics when exposed to light of a given frequency.	
PIERCE DIE	A printed circuit die producing openings or holes in the material by punching out "scrap" or "slugs".	
PINHOLES	Small imperfections which penetrate entirely through the conductor.	
PIT	A depression in the conductive layer that does not penetrate entirely through it.	
PLASTICIZER	Material added to resins to make them softer and more flexible when cured.	
PLATED-THROUGH HOLE	A hole formed by deposition of metal on the sides of the hole and on both sides of the base to provide electrical connection from the conductive pattern on one side to that on the opposite side of the printed circuit board.	<b>PTH</b>
PLATING VOID	The area of absence of a specific metal from a specific cross-sectional area: (1) When the plated-through hole is viewed as cross-sectioned through the vertical plane, it is a product of the average thickness of the plated metal times the thickness of the board itself as measured from the outermost surfaces of the base copper on external layers. (2) When the plated-through hole is viewed as cross-sectioned through the horizontal plane (annular method), it is the difference between the area of the hole and the area of the outside diameter of the through-hole plating.	
POLYESTER FILMS	A broad category of films that differ in chemical composition, properties, and processability, but which exhibit very good electrical properties. Heat sealable polyester films are designed for such applications as protective laminations for flexible printed circuitry and flat cable, standard wire and cable insulation, transformer layer insulation, coil cover wrappings, forming of laminates and tubings, and component packaging.	
POLYETHERSULFONE RESINS	A plastic film suitable for use in printed and intergrated circuits, electrical insulation, and flat cable. This film is characterized by high tear resistancy, good clarity, and excellent dimensional stability.	
POLYLMIDE FILM	A plastic film exhibiting excellent physical and electrical properties over a wide temperature range. Produced from pyromellitic dianhydride and an aromatic diamine, it is used as a printed circuit substrate.	
POLYLMIDE RESINS	High temperature thermoplastics used with glass to produce printed circuit laminates for multilayers and other demanding circuit applications. They provide excellent resistance to frictional wear and oxidative degradation.	
POLYMER	(A) A high-molecular-weight compound made up of repeated small chemical units. For practical purposes, a polymer is a plastic. The small chemical unit is called a mer, and when the polymer or mer is cross-linked between different chemical units (e.g., styrene-polyester), the polymer is called a copolymer. A monomer is any single chemical from which the mer or polymer or copolymer is formed. (B) A compound formed by polymerization which results in the chemical union of monomers or the continued reaction between lower molecular weight polymers.	
POLYMERIZE	To unite chemically two or more monomers or polymers of the same kind to form a molecule with higher molecular weight.	



Term	Definition	Ellipsis
POLYPARABANIC ACID FILM	A plastic film that demonstrates good physical, chemical, dielectric, and insulating properties over a broad temperature range. It is used as a substrate for flexible printed circuits, and when combined with adhesives it yields an electronic tape which protects delicate printed board components.	PPA
POSITIONAL LIMITATION TOLERANCING	A method of tolerancing hole locations in which the location tolerance is defined by placing limitations on the minimum annular ring of the terminal area. This method should only be used where precise alignment of holes to external parts or tooling is not a factor. Also see: Coordinate Tolerancing and True Position Tolerancing.	
POSITIVE	An artwork, artwork master, or production master in which the intended conductive pattern is opaque to light, and the areas intended to be free from conductive material are transparent.	
POSITIVE-ACTING RESIST	A resist which is decomposed (softened) by light and which, after exposure and development, is removed from those areas which were under the transparent parts of a production master.	
POTLIFE	The time during which a liquid resin remains workable as a liquid after catalysts, curing agents, promoters, etc., are added. It is roughly equivalent to gel time.	
POTTING	Enclosing an article in a closed plastic envelope with steps taken to insure complete penetration of all voids in the object before the resin polymerizes.	
POWER FACTOR	The cosine of the angle between the applied voltage and the resulting current.	
PRECIOUS METAL	One of the relatively scarce and valuable metals; gold, silver, and the platinum group metals.	
PREPREG	Sheet material consisting of the base material impregnated with a synthetic resin such as epoxy or polyimide partially cured to the B-stage. They are molded under heat and pressure for multilayer printed circuitry and are actually used for bonding together the individual circuit layers of multilayer printed circuit boards.	
PREPRODUCTION TEST BOARD	A test board (as detailed in IPC-ML-950) the purpose of which is to determine whether, prior to the production of finished boards, the contractor has the capability of producing a multilayer board satisfactorily.	
PRESS PLATEN	The flat heated surface of the lamination press used to transmit heat and pressure to lamination fixtures and into the lay-up.	
PRESS-FIT CONTACT	An electrical contact which can be pressed into a hole in an insulator printed board (with or without plated-through holes), or a metal plate.	
PRINTED BOARD ASSEMBLY	A printed circuit board to which separable components have been assembled or to one or more printed circuit boards which may include several components.	
PRINTED CIRCUIT BOARD	See Printed Board	



Term	Definition	Ellipsis
PRINTED CIRCUIT BOARD	<p>The general term for completely processed printed circuit or printed wiring configurations. It includes single, double, and multilayer boards, both rigid and flexible.</p> <p>This term is in common use with at least two meanings. (1) A generic term to describe a printed board produced by any of a number of techniques used to fabricate electrical interconnect system. (2) A circuit obtained by printing and comprising printed components, printed wiring, or a combination thereof, all formed in a predetermined design in, or attached to a surface or surfaces of a common base.</p>	<b>PCB</b>
PRINTED CIRCUIT CHEMICALS	<p>All the cleaning solutions resist, etchants, plating solutions, and similar materials as specifically applied to the manufacturing of circuits.</p>	
PRINTED COMPONENT PART	<p>A component part, such as an inductor, resistor, capacitor, or transmission line, which is formed as part of the conductive pattern of the printed board.</p>	
PRINTED CONTACT	<p>A portion of a conductive pattern formed by printing, serving as one part of a contact system.</p>	
PRINTED WIRING ASSEMBLY DRAWING	<p>A document that shows the printed board (rigid or flexible), the separately manufactured components which are to be added to the board, and any other information necessary to describe the joining of these parts to perform a specific function.</p>	
PRINTED WIRING BOARD	<p>See Printed Board</p>	
PRINTED WIRING LAYOUT	<p>A sketch that depicts the printed wiring substrate, the physical size and location of electronic and mechanical components, and the routing of conductors that interconnect the electronic parts in sufficient detail to allow for the preparation of documentation and artwork.</p>	
PRINTED WIRING TEST EQUIPMENT	<p>Equipment used for high reliability testing of printed circuits, components, and assemblies. Probing devices range from manual probers for laboratory or low volume use to computer controlled systems.</p>	
PRINTING WIRING	<p>A conductive pattern within or bonded to the surface of a base material intended for point to point connection of separate components and not containing printed components.</p>	
PRODUCTION MASTER	<p>A 1 to 1 scale pattern which is used to produce one or more printed boards (rigid or flexible) within the accuracy specified on the Master Drawing.</p> <ul style="list-style-type: none"> <li>- Single-Image Production Master A production master used in the process of making a single printed board.</li> <li>- Multiple-Image Production Master A production master used in the process of making two or more printed boards simultaneously.</li> </ul>	
PROGRAMMABLE READ-ONLY MEMORY	<p>A ROM that can be programmed by the user only once. After a PROM is programmed, it effectively becomes a ROM.</p>	<b>PROM</b>
PROGRESSIVE DIE	<p>A printed circuit die that performs separate operations at each station as material travels from one station to another. Progressive dies offer production of complicated internal shapes in several steps, removal of part from panel or reinsertion, concentration of holes can be spaced out over two or more stations.</p>	
PROMOTER	<p>A chemical, itself a feeble catalyst, that greatly increases the activity of a given catalyst.</p>	



Term	Definition	Ellipsis
PROPAGATION DELAY	A measure of the time required for a signal to travel from one point to another in a circuit.	
PULL STRENGTH	See Bond Strength	
PULL-OUT	The holding characteristic when attaching two conductors to each other, such as a solderless terminal to a wire.	
PULSE VACUUM	Desoldering method utilizing either a soldering iron plus a pulse vacuum device (such as a squeeze bulb or plunger), or a combination unit in which a soldering iron has a pulse vacuum device attached. In use the iron melts the solder first, then the squeezed bulb (or plunger) is released to draw in the solder. Also called Solder Sucker method.	
PUNCH	Usually the upper male or relief member which nests into the die-plate to produce a part.	
PURPLE PLAGUE	One of several gold-aluminum compounds formed when bonding gold to aluminum and activated by re-exposure to moisture and high temperature (34 deg C). It is purplish in color, very brittle, and potentially leading to time-based failure of the bonds. Its growth is enhanced by the presence of silicon to form ternary compounds.	
QUALITY CONFORMANCE CIRCUITRY AREA	A test board made as an integral part of the multilayer printed board panel on which electrical and environmental tests may be made for evaluation without destroying the basic board.	
RANDOM ACCESS MEMORY	(1) A storage arrangement from which information can be retrieved with a speed that is independent of the location of the information in the storage. (2) A memory that can be written into or read by locating any data address.	<b>RAM</b>
RAW MATERIAL PANEL SIZE	A standard panel size related to machine capacities, raw material sheet sizes, final product size, and other factors.	
READ OUT (READOUT)	A term used with printed circuit boards and connectors, meaning the ability to make contact with certain circuits. Example: a double read out PC connector will permit two wires to be connected to any one circuit on the PC board.	
READ/WRITE MEMORY	A memory whose contents can be continuously changed quickly and easily during system operation.	<b>RWM</b>
READMAP	A printed pattern of nonconductive material by which the circuitry and components are delineated on a board to aid in service and repair of the board.	
READ-MOSTLY MEMORY	An integrated array of amorphous and crystalline semiconductor devices that is capable of being programmed, read, and reprogrammed repeatedly. Once programmed, this type of memory retains data unless it is altered intentionally.	<b>RMM</b>
READ-ONLY MEMORY	(1) A storage arrangement primarily for information-retrieval application. The information may be wired in when the storage device is made, or it may be written in at a speed much less than the retrieval speed. (2) A memory that cannot be altered in normal use of a computer. Usually a small memory that contains often used instructions such as microprograms or system software as firmware. Peripheral equipment uses ROM for character generation, code translation, and for designing peripheral processors.	<b>ROM</b>
REFERENCE DESIGNATIONS	Diagram markings that distinguish one graphic symbol from another and correlate these identifications with actual components on the part lists and assembly drawings. They consist of a combination of letters and numbers that identify the class of the component.	



Term	Definition	Ellipsis
REFLOW SOLDERING	Method in which a solder joint is made by melting the solder coatings on the mating components.	
REFLOWING	The melting of an electrodeposit followed by solidification. The surface has the appearance and physical characteristics of being hot-dipped.	
REFRACTIVE INDEX	The ratio of the velocity of light in a vacuum to the velocity in a substance. Also, the ratio of the sine of the angle of incidence to the sine of the angle of refraction.	
REGISTER MARK	A mark used to establish the relative position of one or more printed wiring patterns, or portions thereof, with respect to desired locations on the opposite side of the board.	
REGISTRATION	(A) The relative position of one or more printed wiring patterns, or portions thereof, with respect to desired locations on a printed wiring base or to another pattern on the opposite side of the base. (B) The degree of conformity of the position of a pattern, or a portion thereof, with its intended position or with that of any other conductor layer of a board.	
RELATIVE HUMIDITY	The ratio of the quantity of water vapor present in the air to the quantity which would saturate the air at the given temperature.	
REPAIR	The correction of a printed wiring defect after the completion of board fabrication to render the board as functionally good as a perfect board.	
REPAIR AND REWORK TOOLS	Wire strippers; soldering and desoldering devices and tools, power tools for sanding, drilling, sawing, cutting, abrading and brushing platers, cleaning units, and spraying devices specifically designed for repair and rework.	
REPAIRING	The act of restoring the functional capability of a defective part without necessarily restoring appearance, interchangeability and uniformity.	
RESIN	(1) An inorganic substance of natural or synthetic origin which is polymeric in structure and predominantly amorphous. (2) High-molecular-weight organic material with no sharp melting point. For current purposes, the terms "resin," "polymer," and "plastic" can be used interchangeably.	
RESIN SMEAR	Resin transferred from the base material onto the surface or edge of the conductive pattern normally caused by drilling. Sometimes called Epoxy Smear.	
RESIN STARVED AREA	An area in a printed board that has an insufficient amount of resin to wet out the reinforcement completely, evidenced by low gloss, dry spots, or exposed fibers.	
RESIN-RICH	A significant thickness of nonreinforced surface-layer resin of the same composition as that within the base material.	
RESIST	(A) A protective coating (ink, paint, metallic plating, etc.) used to shield desired portions of the printed conductive pattern from the action of etchant, solder, or plating. (B) Coating material used to mask or to protect selected areas of a pattern from the action of an etchant solder, or plating. Also see: Dry Film Resists, Etching Resists, Plating Resists, and Solder Resists.	
RESISTANCE	Property of a conductor that determines the current produced by a given difference of potential. The ohm is the practical unit of resistance.	<b>R</b>
RESISTANCE SOLDERING	A method of soldering in which a current is passed through and heats the soldering area by contact with one or more electrodes.	
RESISTIVITY	The ability of a material to resist passage of electrical current either through its bulk or on a surface.	



Term	Definition	Ellipsis
RESISTOR TRANSISTOR LOGIC	A form of logic that has a resistor as the input component that is coupled to the base of an npn transistor. The transistor is an inverting element that produces the positive NOR gate or the negative NAND gate function.	RTL
RESISTORS	Devices that provide a means of limiting current flow and dividing or dropping voltage. The majority of resistors sold consist of a resistive element to which axial or radial leads are attached and to which a protective coating or molding is applied. Resistor networks consisting of resistive inks screen printed on a flat ceramic base reduce assembly time in printed circuit applications.	
REVERSE IMAGE	The resist pattern on a printed board used to allow for the exposure of conductive areas for subsequent plating.	
REVERSION	A chemical reaction in which a polymerized material degenerates at least partially, to a lower polymeric state or the original monomer. It is usually accompanied by significant changes in physical and mechanical properties.	
REWORKING	The act of repeating one or more manufacturing operations for the purpose of improving the yield of acceptable parts.	
RIBBON CABLE	Nonpreferred term for Flat Cable.	
RIGHT-ANGLE EDGE CONNECTOR	A connector which terminates conductors at the edge of a printed board while bringing the terminations out at right angles to the plane of the board conductors.	
RIGID PRINTED WIRING	Printed wiring with conductive layers supported by a rigid insulating laminate.	
ROBBER	Nonpreferred term for Thief.	
ROCKWELL HARDNESS NUMBER	A number derived from the net increase in depth of an impression as the load on a penetrator is increased from a fixed minimum load to a higher load and then returned to minimum load.	
ROLL TINNING	Process of coating printed circuit boards with solder to improve shelf life and circuit solderability. It is achieved via specially designed, roll tinning machines.	
ROLL TINNING MACHINES	Equipment designed to coat printed circuit boards with solder. Roll tining machinery includes a precision metallic roller which is partially immersed in the solder bath; a clutch controlled, silicone, rubber-covered, pressure roller which assures contact between the circuit surface and the tinned metallic roller; and side scrapers that wipe the roller ends to prevent roll salts from contaminating the clean solder. Controls include a variable speed ranging from 0 to 30 lineal feet per minute, and a thermostat to control solder bath temperature.	
ROSIN FLUX	The mildest and least effective of solder fluxes. To increase rosin flux efficiency, small amounts of organic activating agents are added. Type RA, fully activated rosin flux, is the flux most commonly used for electrical connections.	
ROTARY DIP TEST	A solderability test method for testing PC boards. An arm brings a sample into contact with a molten solder bath for a pre-set time, but in such a manner that there is relative horizontal motion of board and bath, thereby better simulating a mass soldering operation. The exposed surface is examined and acceptability depends upon complete wetting of the board occurring before some "minimum wetting time".	



Term	Definition	Ellipsis
ROUTING AND PROFILING EQUIPMENT	Apparatus used for printed circuit routing and profiling including; hand held, electrically powered, or air-operated tools; numerically controlled machine tools; single-spindle machines with which the operator uses a template to guide a stack of boards past a cutter. NC multiple-spindle router profiler with an X-Y positioning table, and beveling machines that put edges on circuit boards.	
SCHEMATIC DIAGRAM	A drawing which shows, by means of graphic symbols, the electrical interconnections, components, and functions of a specific circuit arrangement.	
SCHEMATIC ORIENTATION	A design concept which works well if the inputs can be located on one edge of the board and the outputs along the opposite edge. If the schematic has been drawn with a "physical" sense and a minimum of interconnection crossovers, the layout is begun by placing components in the same physical order as they appear on the schematic diagram.	
SCHOTTKY DIODES; SCHOTTKY TTL	Diodes formed by aluminum which contacts bare silicon between the base and collector. By clamping the transistor out of saturation, these diodes cut down on the switching time of the transistors. Schottky diodes are often used in place of gold doping, which also adds speed to transistors. (See Logic IC and TTL.)	
SCREEN	Surface on which the master artwork of the circuit pattern is projected. Screen fabrics include polyester, stainless steel, nylon, and silk.	
SCREEN PRINTING	Manually operated, semi-automatic, or fully automatic devices that transfer a pattern onto a substrate by forcing a paste through a stencil screen with a squeegee. The different units vary in maximum printing area, repeatability accuracy, speed range, stock sizes and thicknesses acceptable, registration system, uniformity of squeegee pressure and movement, and variability of squeegee stroke.	
SCRIBING PLOTTER	An accurate (+/- 0.005 inch or better) flatbed plotter with a programmable scribing assembly. Most often used to produce actual size, negative image, master patterns for printed-wiring and/or printed circuit artwork.	
SCRUBBERS	Units designed to scrub, polish, rinse and/or dry circuit boards with brushes and abrasive wheels. Scrubbers can be automatic or semi-automatic involving dry or wet cleaning methods.	
SEED LAYER	See Activating.	
SEEDING	Nonpreferred term for Acitivating.	
SELECTIVE PLATING	A process of plating only a selected portion of a contact, usually the mating surface. Two methods can be used:  (1) Nickel plating the entire contact, then gold plating the selected area.  (2) Nickel plating and then gold flash over the entire contact, and finally a selective heavy gold plating in the desired contact area.	
SEMI-ADDITIVE PROCESS	An additive process for obtaining conductive patterns which combines an electroless metal deposition on an unclad substrate with eletroplating or with etching, or with both.	
SENSITIVITY	Measure of the ability of a device or circuit to react to a change in some input.	
SENSITIZING	Nonpreferred term for Activating.	



Term	Definition	Ellipsis
SEPARABLE COMPONENT PART	A replaceable component part, the body of which is not chemically bonded (excluding protective coatings, solder, and potting materials) to the base material.	
SERIAL ACCESS MEMORY	A memory in which information is stored in series and reading or writing of information is done in time sequence, as with a shift register. Compared to a RAM, a serial memory has slow to medium speed and lower cost.	<b>SAM</b>
SEXLESS CONNECTOR	See Hermaphroditic connector.	
SHADOWING	A condition occurring during etchback in which the dielectric material, immediately next to the foil, is incompletely removed although acceptable etchback may have been achieved elsewhere.	
SHIELDING, ELECTRONIC	A physical barrier, usually electrically conductive, designed to reduce the interaction of electric or magnetic fields upon devices, circuits, or portions of circuits.	
SIGNAL	An electrical impulse of a predetermined voltage, current, polarity, and pulse width.	
SIGNAL CONDUCTOR	An individual conductor used to transmit an impressed signal.	
SIGNAL PLANE	A conductor layer intended to carry signals, rather than serve as a ground or other fixed voltage function.	
SILICON-ON-SAPPHIRE METAL OXIDE SEMICONDUCTOR	Semiconductor technology which relies on a very dense single-crystal silicon film grown on an insulating substrate of sapphire. This construction technique allows complete circuit component isolation with minimum parasitic interdevice capacitance and leakage currents, resulting in extremely fast switching speed or high frequency operation.	<b>SOS</b>
SILK SCREEN	See Screen Printing.	
SILVER		<b>Ag</b>
SINGLE-IMAGE PRODUCTION MASTER	A production master used to produce individual products.	
SINGLE-SIDED BOARD	A printed board with a conductive pattern on one side only.	
SMALL-SCALE INTEGRATION	Integrated circuit of low complexity consisting of less than 100 elements.	<b>SSI</b>
SOLDER	An alloy that melts at relatively low temperatures, and which is used to join or seal metals with higher melting points. Solder alloys melt over a range of temperatures, the temperature at which a solder begins to melt is the solidus, and the temperature at which it is completely molten, is the liquious.	
SOLDER CONTACT TERMINAL	A point at which the connector is soldered directly to the mother board by hand, wave or dip methods.	
SOLDER EXTRACTION	Desoldering technique utilizing a continuous vacuum mode with controlled joint heating and cooling, a hot air jet and or heat and air pressure. In the continuous vacuum mode, the tip first melts the solder, then continuous vacuum removes the solder from the joint and cools down the pad and plated-through hole to protect them from damage, while preventing resweat of the lead to the hole. The hot air jet method is ideal for planar mounted components where the hot air first melts the solder permitting the leads to be removed without touching the joint. The heat and pressure technique permits solder to be melted and blown out the bottom of the hole.	



Term	Definition	Ellipsis
SOLDER FLUX	A substance which transforms a passive, contaminated metal surface into an active, clean, solderable surface. Generally, all such fluxes should prevent oxidation during heating, lower interfacial surface tensions, be thermally stable, be easily displaced by molten solder, be noninjurious to components, remove easily if desired, remove oxide, and penetrate films. Also see: Organic Water Soluble Flux, and Rosin Flux.	
SOLDER FUSION EQUIPMENT, INFRARED	Systems that change the porous, electroplated tin-lead on a circuit into an alloy with a strong bond to the base copper. Conveyorized infrared fusing systems fuse both sides of a double-sided board simultaneously at speeds up to 20 feet/minute. They consist of a fluid application stage for applying fusing fluid, a preheat zone, a fusing zone, and a cooling zone. Washers and dryers must be interfaced with the system to remove residues.	
SOLDER LEVELING	The process of dipping printed circuit boards into hot liquids, or exposing them to liquid waves to achieve fusion. First, flux is applied to the board by dipping or brushing. Then the board is preheated in a liquid (maintained at 250 degrees F). Next the board is immersed, using a liquid of 430 to 500 degrees F. Finally it is dipped in another 250 degree F liquid to cool it and reduce thermal shock. Thin fused coatings can be applied.	
SOLDER LEVELING EQUIPMENT	Systems involve in dipping printed circuit boards into hot liquids, or exposing them to liquid waves to achieve fusion. Such systems can include heating tanks that contain preheating or fusing liquids, roller coating, spin coating, and hydraulic squeegee systems that apply thin fused coatings, solder screen printers to apply solder paste to component pads and or circuit paths or pads, the reflow solder unit, and in-line spray cleaners.	
SOLDER MASK	Nonpreferred term for Resist.	
SOLDER MASK OVER BARE COPPER		<b>SMOBC</b>
SOLDER PLUG	A volume of solder that fills a plated-through hole from land to land.	
SOLDER PROJECTION	An undesirable protrusion of solder from a solidified solder joint or coating.	
SOLDER RESIST	Coatings which mask off and surface insulate those areas of a circuit where soldering is not desired. The classical method of solder-masking a circuit board consists of screen printing a barrier material onto the board surface. These solder mask inks are available in a variety of chemistries, but typically are epoxy-based systems. Dry film photoimagable solder masks offer property advantages over screened inks and are finding wide acceptance in the market-place. Solder mask films meet standard UL test for flame retardancy. Photoimaging provides high resolution and registration accuracy. The thick solder mask film remains on the finished board to serve as an electrical, environmental and physical barrier.	
SOLDER SIDE	The side of a printed board which is opposite to the component side.	
SOLDER SUCKER	Desoldering technique; also called Pulse Vacuum method.	
SOLDERABILITY	The property of a metal to be wetted by solder.	
SOLDERABILITY TESTING	There are several test systems presently in use for both printed circuit boards and components. An additional test can be used for plated-through holes and components. They are (1) the oldest and most accepted, the edge dip solderability test, (2) the meniscus test, and (3) the globule test. In addition to these, any test, mutually agreed to by vendor and customer for the solderability of components including printed circuit boards, is acceptable.	



<b>Term</b>	<b>Definition</b>	<b>Ellipsis</b>
SOLDERED JOINT	Point of bonding between solder and component surfaces. Three overriding factors influence the quality of a soldered joint. These are the nature of the surfaces of the items to be joined, the solder alloy used to effect the joining operation, and the flux which assists in obtaining intimate contact between the solder and the surfaces by eliminating the last traces of surface contamination.	
SOLDERING	A process of joining metallic surfaces with solder, without the melting of the base metals.	
SOLDERING FLUID	A liquid used with wave solder systems that can be intermixed with solder to reduce the surface tension of solder, promote wetting and eliminate the formation of dross. See Soldering Oils and Tinning Oils.	
SOLDERING IRON TIP	A high purity copper substrate form, iron plated 0.006 inches to 0.030 inches thick. Hot dipped in the working area and the remaining surface immunized by nickel-chromium plating. The working area of the tip is usually fabricated for access and maximum heat transfer to the work point. There are a number of standard point configurations available for most soldering irons. The various shank configurations are: (1) plug (fitting in a cylindrical heating well). (2) threaded (internal and external), and (3) sleeve (fitting over a heating madre).	
SOLDERING IRONS AND GUNS	Category of soldering tools including pistol grip guns with trigger-action control of low or high tip temperatures for general use, with output ranges commonly rated at 100/140, 145/210, or 240/325 watts. Temperature controlled guns designed for solid state electronics work with interchangeable power heads for varying fixed tip temperature, industrial grade irons with 25 and 40 watt outputs, 12-volt field-use irons with fixed tip temperature and battery (power source) clips, portable controlled output irons rated at 60 or 100 watts with interchangeable tips to provide a selection of fixed temperatures; controlled output soldering stations complete with iron, operating switch, tip cleaning sponge receptacle and tool stand, in both fixed and variable tip models; soldering tool stands; and a variety of interchangeable tip styles and sizes for guns and irons.	
SOLDERING OILS	Liquid compounds formulated for use as the oil in oil intermix wave soldering equipment and as pot coverings on still solder pots. See Tinning Oils.	
SOLDERLESS WIRING MACHINES	Mechanized wire-wrapping systems intended for high production applications. Fully automatic units are independent in operation and offer production rates of about 1000 wires per hour under ideal conditions. Many of these are closed-loop. Semi-automatic systems are more compact than their fully automatic counterparts, and can achieve production rates of 200-400 wires/hour. Computer control is an option on semi-automatic systems. In numerically controlled units all decision information pertinent to the wire-wrapping task is encoded on perforated tape.	
SOLDERLESS WRAP	A method of connecting a solid wire to a square, rectangular, or V-shaped terminal by tightly wrapping the wire around the terminal with a special tool.	
SOLUTIONS	Homogenous mixtures of inorganic salts, acids or other inorganic and organic liquids or solids. They can be used as cleaning agents and as agents for the removal of photoresist.	



SOLVENTS	<p>Organic liquids used for cleaning. There are three general categories. (1) hydrocarbon solvents, (2) chlorinated solvents, and (3) fluorinated solvents.</p> <p>Hydrocarbon solvents include alcohols, ketones, and some other aliphatic compounds, and are usually polar solvents. They are not strong solvents, are mostly of medium toxicity and compatibility. They are highly flammable. They should never be used in a vapor degreaser.</p> <p>Chlorinated solvents are chlorinated hydrocarbons and include methylene (perchloroethylene), trichloroethylene, methylchloroform, chloroform, and carbon tetrachloride. These products are strong solvents, generally non-polar, and are not flammable, but all are hazardous by definition. They are suitable for use in a vapor degreaser.</p> <p>Fluorinated solvents are fluorinated or fluorinated-chlorinated hydrocarbons, and include trichlorotrifluoroethane, trichloromonofluoromethane, and tetrachlorodifluoroethane. These products are not flammable, are quite compatible with material of construction, relatively low in toxicity, and low in solvent power. These products are also suitable for use in a vapor degreaser.</p> <p>In addition to the three general categories there are a variety of azeotropic compositions consisting of solvents from each of the three groups. Frequently these zeotropes consist of a fluorinated solvent with small amounts of hydrocarbon and chlorinated solvent added to increase the solvent power without the risk of flammability or extreme hazard. Since azeotropes are constant boiling mixtures, they can be used in a vapor degreaser without fractionation.</p>
SPAN	<p>The distance from the reference edge of the first conductor to the reference edge of the last conductor, expressed in decimal inches or centimeters.</p>
SPECIFIC HEAT	<p>The ratio of the thermal capacity of a material to that of water at 15 degrees C.</p>
SPRAY FLUXING	<p>A specialized wave solder fluxing technique in which a fine stainless steel screen drum is rotated in liquid flux. The amount of flux transferred is controlled by the rotational speed of the drum and air pressure. The drum contains air jets. Also see: Brush fluxing, Foam fluxing, and Wave fluxing.</p>
SPRING CONTACT PROBE	<p>The element that provides the electrical connection between a particular node on the product to be tested and the verifier electronics. Usually spring loaded to allow some thickness, lead length, and other product variations. Also called: Spring Pin or Spring Probe.</p>
SPURIOUS SIGNAL	<p>See Crosstalk.</p>
STABILIZER PROCESS	<p>A method for holding components for automatic lead cutting and wave soldering.</p>
STAMPED PRINTED WIRING	<p>Wiring which is produced by die stamping and which is bonded to an insulating base.</p>
STARVATION, RESIN	<p>A deficiency of resin in base material which is apparent after lamination by the presence of weave texture.</p>
STATIC ELIMINATORS	<p>A broad range of devices that neutralize nonconductive materials by producing a region of ionized air through which the charged material can pass. Induction static bars consist of a row of grounded metallic points or tufts placed as close as possible to the moving material without touching it. Radioactive static bars employ a coating of radioactive substance facing toward the material to be discharged at a distance of about one inch. Electrical static bars have a series of points maintained at high voltage but usually capacity coupled to the voltage source so that they are shock-free even when touched. A small power unit energizes the electrical bars which are placed about one inch from the moving material. Ionizing air guns and blowers also neutralize static. See Antistatic Sprays.</p>



Term	Definition	Ellipsis
STEEL RULE DIE	The simplest type of die used in flexible circuitry. It is composed of a steel bar with a sharply filed edge which is bent to the required shape and embedded in plywood. This die is commonly used in cutting shapes from paper, and can only be used on the very thin circuit materials.	
STEP SCALE, STEP-WEDGE	A series of regular spaced tones ranging from clear to black through intermediate shades of gray and used as a reference scale for exposure control in photo-fabrication.	
STEP-AND-REPEAT	A method by which successive exposures of a single image are made to produce a Multiple Image Production Master.	
STORAGE LIFE	The period of time during which a liquid resin or adhesive can be stored and remain suitable for use. Also called Shelf Life.	
STRAIN	The deformation resulting from a stress. It is measured by the ratio of the change to the total value of the dimension in which the change occurred.	
STRESS	The force producing or tending to produce deformation in a body. It is measured by the force applied per unit area.	
STRESS RELIEF	A predetermined amount of slack to relieve tension in component or lead wires.	
STRIPLINE	A type of transmission line configuration which consists of a single narrow conductor parallel and equidistant to two parallel ground planes.	
STRIPPERS, RESIST	Solutions that remove resists from circuit surfaces. In some cases, the stripper lifts the resist, rather than dissolving it, thus permitting easy filtration and additional use of the solution.	
STRIPPERS, SOLDER	Acidic solutions which chemically dissolve solder or other tin-lead alloys at room temperature. These strippers can be used for removing tin lead plate from printed circuit boards. Stripping rate is approximately 6 mils per hour (higher with work agitation).	
STRIPPING	An exaggerated problem in printed circuit board material. The fibers of the glass material grip the punches when they retract and these abrasive fibers exert a drag of upto 50% of the original punching pressure.	
SUBSTRATE	(A) A material on whose surface an adhesive substance is spread for bonding or coating. Also, any material which provides a supporting surface for other materials used to support printed wiring patterns. (B) The physical material upon which an electronic circuit is fabricated. Used primarily for mechanical support but may serve a useful thermal or electrical function. Also called Base Material.	
SUBTRACTIVE PROCESS	A process for obtaining conductive patterns by the selective removal of unwanted portions of a conductive foil.	
SUPPORTED HOLE	A hole in a printed board that has its inside surface plated or otherwise reinforced.	
SURFACE CONDUCTANCE	Conductance of electrons along the outer surface of a conductor.	
SURFACE INDUCTION TRANSISTOR		<b>SIT,SIL</b>
SURFACE LEAKAGE	The passage of current over the boundary surface of an insulator as distinguished from passage through its volume.	
SURFACE MOUNTING	The electrical connection of components to the surface of a conductive pattern without utilizing component holes.	



Term	Definition	Ellipsis
SURFACE NUCLEATION	The change in phase or state of the surface on a substrate.	
SURFACE RESISTIVITY	The resistance of a material between two opposite sides of a unit square of its surface. Surface resistivity may vary widely with the conditions of measurement.	
SURGE	A transient variation in the current and/or potential at a point in the circuit.	
SWAGED LEADS	Component lead wires which extend through the printed board and are flattened, or swaged, so as to secure the component to the board during manufacturing operations.	
TAB	Nonpreferred term for Printed Contact.	
TAPED COMPONENTS	Components attached to a continuous tape for and used in automatic assembly.	
TENTING	A printed board fabrication method of covering over plated-through holes and the surrounding conductive pattern with a resist, usually dry film.	
TERMINAL	A point to which electric connections can be made. Solder contact, crimp, clip, and solderless wrap are commonly used PC terminals.	
TERMINAL AREA	A portion of a conductive patterns usually, but not exclusively, used for the connection and/or attachment of components. Nonpreferred term for Land.	
TERMINAL CLEARANCE HOLE	See Access Hole.	
TERMINAL HOLE	A hole used for the attachment and electrical connection of component terminations, including pins and wires, to the printed board. Also called Component Hole.	
TERMINAL PAD	See Land.	
TEST BOARD	A printed board suitable for determining acceptability of the board or of a batch of boards produced with the same process so as to be representative of the production board.	
TEST COUPON	(1) A sample or test pattern usually made as an integral part of the printed board, on which electrical, environmental, and microsectioning tests may be made to evaluate board design or process control without destroying the basic board. (2) A portion of a printed board or of a panel containing printed coupons, used to determine the acceptability of such a board(s).	
TEST PATTERN	A pattern used for inspection or testing purposes.	
TEST POINT	Special points of access to an electrical circuit, used for testing purposes.	<b>TP</b>
TETRA-ETCH	A nonpyrophoric (will not ignite when exposed to moisture) proprietary etchant.	
THERMAL CONDUCTIVITY	The ability of a material to conduct heat; the physical constant for the quantity of heat that passes through a unit cube of a material in a unit of time when the difference in temperatures of two faces is 1 degree C.	
THERMOPLASTIC	A classification of resin that can be readily softened and resoftened by repeated heating.	
THERMOSETTING	A classification of resin which cures by chemical reaction when heated and, when cured, cannot be resoftened by heating.	



Term	Definition	Ellipsis
THIEF	(1) An auxiliary cathode so placed as to divert to itself some current from portions of the work which would otherwise receive too high a current density. (2) A racking device used in the electroplating process to provide a more uniform current density on plated parts. Thieves absorb the unevenly distributed current on irregularly shaped parts, thereby assuring that the parts will receive an electroplated coating of uniform thickness.	
THIN FOIL	A metal sheet less than 0.0007 inches (1/2 oz.) thick.	
THIXOTROPIC	Said of material that are gel-like at rest but fluid when agitated.	
THROUGH CONNECTION	An electrical connection between conductive patterns on opposite sides of an insulating base, e.g. plated-through hole or clinched jumper wire.	
THROWING POWER	The improvement of the coating (usually metal) distribution ratio over the primary current distribution ratio on an electrode (usually a cathode). Of a solution, a measure of the degree of uniformity with which metal is deposited on an irregularly shaped cathode. The term may also be used for anodic processes for which the definition is analogous.	
TIE BAR	Nonpreferred term for Plating Bar.	
TIN		Sn
TINNING OILS	Liquid compounds formulated for use as the oil in oil intermix wave soldering equipment and as pot coverings on still solder pots. They serve primarily to provide a barrier between the atmosphere and molten solder, thereby reducing the oxidation (drossing) of solder, and also serve to reduce the surface tension of the molten solder, thereby enhancing the wetting characteristics of the solder. Also called Soldering Oils, Soldering Fluids, and Wave Oils.	
TOOLING HOLES	The general term for holes placed on a printed board or a panel and used to aid in the manufacturing process.	
TRADE BALANCE	Exports minus Imports.	
TRANSMISSION CABLE	Two or more transmission lines. If the structure is flat, it is called a flat transmission cable to differentiate it from a round structure, such as a jacketed group of coaxial cables. See Transmission Line.	
TRANSISTOR-TRANSISTOR LOGIC	Logic system which evolved from DTL when the multiple diode cluster on the input was replaced by a multiple emitter transistor. TTL is normally applied to a circuit that has a multiple emitter input and a phase splitting transistor. TTL is the most common bipolar logic technology, and variants include Schottky TTL and low-power Schottky TTL. The Schottky diode basically prevents the output transistor and phase splitter transistor from going into saturation, thus speeding up the circuit.	TTL
TRANSLATOR HEAD	An interchangeable test head whose interface connects to the test pattern in the dedicated head.	
TRANSMISSION LINE	A signal-carrying circuit composed of conductors and dielectric material with controlled electrical characteristics used for the transmission of high-frequency or narrow-pulse type signals.	
TREATMENT TRANSFER	The transfer of copper foil treatment to the base material as indicated by the presence of black, brown, or red streaks after the copper has been removed by etching.	
TRIM LINES	Lines which define the border of a printed board. See also Corner Mark.	



Term	Definition	Ellipsis
TRUE POSITION	The theoretically exact location of a feature or hole established by basic dimension.	
TRUE POSITION TOLERANCE	The total diameter of permissible movement around the true position as shown in the master drawing.	
TRUE POSITION TOLERANCING	A method of tolerancing hole locations. The tolerance is expressed as a radius or diameter of allowable variation from the "true position" center defined by a dimension or grid coordinate. Also see Coordinate Tolerancing and Positional Limitation Tolerancing.	
TWIST	The deformation of a rectangular sheet such that one of the corners is not in the plane containing the other three corners. See also Bow.	
TWO-PIECE CONNECTOR	An interconnecting device in which one mating piece is permanently mounted to the PC board (generally by soldering) while the other is attached to equipment.	
TWO-SIDED BOARD	Nonpreferred term for Double-sided Board.	
ULTRASONIC CLEANING EQUIPMENT	Devices used for ultrasonic immersion include a transducer which converts electrical energy into mechanical energy, an ultrasonic generator, and a tank to contain the cleaning liquid. Automated and conveyORIZED systems exist.	
ULTRASONIC IMMERSION	Cleaning technique depending upon cavitation (the rapid formation of tiny bubbles in a cleaning liquid). Cavitation is created by ultrasonic high intensity sound waves. The agitation of imploding bubbles scrubs the immersed part.	
UNDERCUT	The reduction of the cross section of a metal foil conductor caused by the etchant removing metal from under the edge of the resist.	
UNDERWRITERS SYMBOL	A logotype authorized for placement on a product which has been recognized (accepted) by Underwriters Laboratories, Inc. (UL)	<b>UL</b>
US PRODUCTION	Equals US-produced, US-consumed, plus US change in inventory plus trade balance.	
UV CURING	Polymerizing, hardening, or cross linking a low molecular weight resinous material in a wet coating or ink, using ultra violet light as an energy source. UV techniques allow inks to be 100% convertible. Also UV is fast, requiring small equipment space and low energy requirements, but ink cost per gallon is relatively expensive.	
VAPOR DEGRESSERS	Cleaning equipment. Printed circuit parts are suspended in a chamber while heated solvent vapors condense on their surfaces, repeated flushing is achieved with fresh solvent.	
VAPOR PHASE	Method of simultaneously soldering variously configured component parts. The process is carried out in a specially equipped chamber, and the high temperature vapor of a boiling fluorinated hydrocarbon is the heat transfer medium. The processing fluid in the bottom of the chamber is heated to its boiling point by immersion heaters. At this point vapor rises from the surface of the liquid. The vapor's temperature is the same as that of the boiling point of the fluid (419 degrees F). Cooling coils at the top of the open chamber are used to contain and condense the vapor generated by the boiling fluid. When the relatively cool part is immersed into the saturated vapor, the vapor condenses on it, giving up its latent heat of vaporization and continuing to transfer heat to the part by conduction to achieve rapid and uniform solder flow.	
VERTICAL METAL OXIDE SEMICONDUCTOR		<b>VMOS</b>



Term	Definition	Ellipsis
VERY LARGE SCALE INTEGRATION	Integrated circuit of very high complexity consisting of a number of circuit components that is in excess of the 16 kb dynamic read/write memory equivalent, such as a 64 kb ROM.	VLSI
VIA HOLE	A plated-through hole used as a through connection, but in which there is no intention to insert a component lead or other reinforcing material.	
VOID	The absence of substance in a localized area.	
VOLT	Unit of electromotive force. It is the difference of potential required to make a current of one ampere flow through a resistance of one ohm.	V
VOLTAGE	The term most used in place of electromotive force, potential, potential difference, or voltage drop to designate electric pressure that exists between two points and is capable of producing a flow of current when a closed circuit is connected between the two points.	E or V
VOLTAGE DIVIDERS	High voltage resistance strings, tapped resistors, potentiometers, adjustable resistors, or series arrangement of two or more fixed resistors connected across a voltage source. Of the total voltage, a desired fraction is obtained from the intermediate tap, movable contact, or resistor junction.	
VOLTAGE PLANE	A conductor or portion of a conductor layer on or in a printed board which is maintained at other than ground potential. It can also be used as a common voltage source, for heat sinking, or for shielding.	
VOLTAGE PLANE CLEARANCE	The etched portion of a voltage plane around a plated-through or non-plated through hole that isolates the voltage plane from the hole.	
VOLUME RESISTIVITY	The electrical resistance between opposite faces of a 1-cm cube of insulating material, commonly expressed in ohm-centimeters. The recommended test is ASTM D 257 51T. Also called Specific Insulation.	
VULCANIZATION	A chemical reaction in which the physical properties of an elastomer are changed by causing the elastomer to react with sulfur or another cross-linking agent.	
WARP	Nonpreferred term for Bow.	
WATER ABSORPTION	The ratio of the weight of water absorbed by a material to the weight of the dry material.	
WAVE FLUXING	A wave solder fluxing method. Flux is applied using the liquid wave principle to form a doublesided, parabolic wave. Washing action of the wave promotes flux coverage of the underside surfaces while capillary forces promote thru-hole penetration. Also see: Brush fluxing, Foam fluxing, and Spray fluxing.	
WAVE OILS	Liquid compounds formulated for use as the oil in oil intermix wave soldering equipment and as pot coverings on still solder pots. See Tinning Oils.	
WAVE SOLDERING	A process wherein printed boards are brought in contact with a gently overflowing wave of liquid solder which is circulated by a pump in an appropriately designed solder pot reservoir. The prime functions of the molten wave are to serve as a heat source and heat transfer medium and to supply solder to the joint area.	
WAVE SOLDERING EQUIPMENT	Systems that achieve wave soldering and which consist of stations for fluxing, preheating and soldering with a means of conveyance. Cleaning is usually offered as an option. Modern standard equipment is capable of pumping wave widths from 2 to 24 inches and wave heights to 3/4 inch. The systems have large solder capacities and automatic solder feed mechanisms.	



Term	Definition	Ellipsis
WEAVE EXPOSURE	A surface condition of the base material in which the unbroken fibers of woven glass cloth are not completely covered by resin.	
WEAVE TEXTURE	A surface condition in which the unbroken fibers are completely covered with resin but exhibit the definite weave pattern of the glass cloth.	
WETTING	(A) The formation of a relatively uniform, smooth, unbroken, and adherent film of solder to a base material. (B) The ability to adhere to a surface immediately upon contact.	
WHISKER	A slender acicular (needle-shaped) metallic growth on a printed board.	
WICKING	(A) Desoldering method utilizing pre-fluxed braid or stranded wire, or braid used with flux. The wick material is placed on the solder joint and a heated iron tip is applied to the wick. Capillary action draws the solder up into the wick material. (B) Migration of copper salts into the glass fibers of the insulating material.	