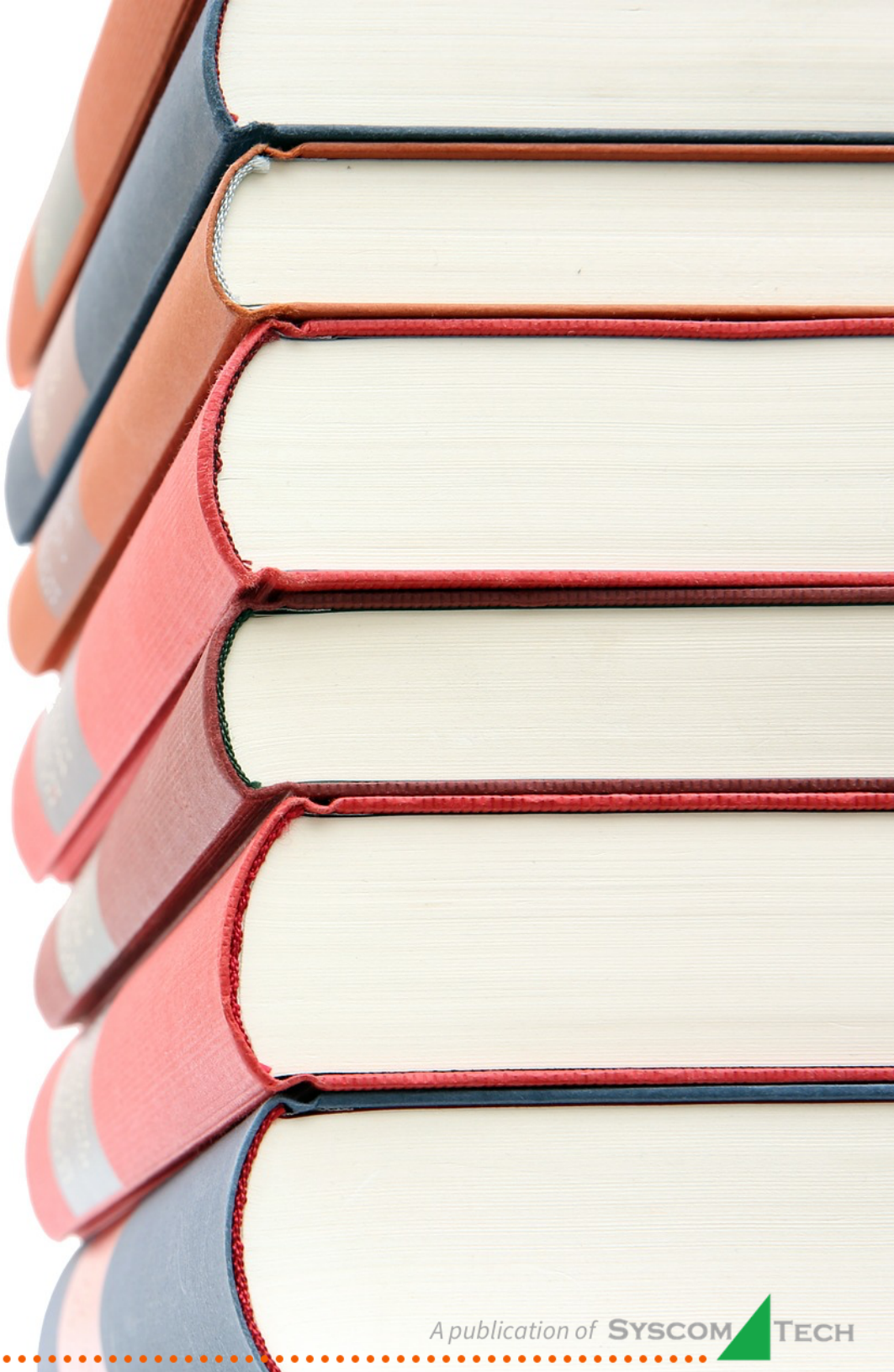
The Ultimate

Electronics Manufacturing Glossary



80 Electronics Manufacturing Terms & Definitions

A publication of SYSCOM TECH

Active Electronic Components

There are two classes of electronic components – active and passive. Active electronic components can control the flow of electricity. Most electronic printed circuit boards have at least one active component. Transistors, vacuum tubes, silicon-controlled rectifiers are all examples of active electronic components.

ABBREVIATION [ACA]

Anisotropic Conductive Adhesive

Anisotropic conductive adhesives are conductive in the Z-axis and are non-conductive in the X- and Y-axis.

ABBREVIATION [ACF]

Anisotropic Conductive Film

Anisotropic Conductive Film is an environmentally friendly and lead-free adhesive interconnect system that is commonly used in liquid crystal display (LCD) manufacturing to make the electrical and mechanical connections from the driver electronics to the glass substrates of the LCD.

ABBREVIATION [AOI]

Automated Optical Inspection

Automated optical inspection is a key technique used when manufacturing and testing printed circuit boards. A camera autonomously scans printed circuit boards under test for both catastrophic failure and quality defects. AOI enables fast and accurate inspection of electronics assemblies, particularly printed circuit board assemblies, to ensure that the quality of product leaving the production line is high and the items are built correctly, without manufacturing faults.

ABBREVIATION [ASIC]

Application Specific Integrated Circuit

Application Specific Integrated Circuit is a chip that's custom designed for a specific application rather than a general-purpose chip. ASICs are used in a wide-range of applications, including auto emission control, environmental monitoring, and personal digital assistants. ASICs are custom designed—often to be smaller, faster or more efficient. They are more expensive to design and manufacture, compared to standard logic integrated circuits.

ABBREVIATION [ATE]

Automated Test Equipment

Automatic test equipment is computer-controlled equipment that tests the performance and functionality of electronic devices. ATEs use control systems and automated information technology to rapidly perform tests that measure and evaluate devices under test. This form of testing is often used in electronic component manufacturing, and specifically for specialized semiconductors.

ABBREVIATION [BGA]

Ball Grid Array

Ball grid array is a type of surface mount technology used for packaging integrated circuits. They are made up of many overlapping layers that can contain one to a million multiplexers, logic gates, flip-flops and other circuits. BGA components are packaged electronically into standardized packages that include a wide array of shapes and sizes. They're well-known for minimal inductance, high lead count and remarkably effective density, and can provide more interconnection pins than dual in-line or flat packages.

Centroid File

A Centroid data file is a computer aided design file that contains information utilized during printed circuit board prototyping, fabrication, and assembly. It lists the reference designation, X, Y, side, top, bottom, and rotation coordinates that automated machinery uses to fabricate and place electronic components on printed circuit boards.

ABBREVIATION [C-Flat Pack]

Ceramic Flat Pack

Ceramic Flat Pack is a square, ceramic surface mount chip that provides leads on all four sides, affording a high lead count in a small area. It is a US military standardized Printed-circuit-board surface-mount-component package. Also commonly referred to as ceramic quad flatpack or ceramic quad flat-package.

ABBREVIATION [C-LCC]

Ceramic Leaded Chip Carrier

Ceramic Leaded Chip Carrier is a ceramic package that's hermetically sealed, and has metallic contacts called castellations, which are flush with the package or recessed instead of leads consisting of metal prongs or wires. The castellations are usually on all four sides of the package.

ABBREVIATION [C-PGA]

Ceramic Pin Grid Array

Ceramic Pin Grid Array is a ceramic package capable of providing up to several hundred pins, all located on its underside. Its design minimizes the distance signals must travel from the chip to each designated pin. C-PGA is often used to package computer chips.

ABBREVIATION [CAD]

Computer Aided Design

Computer-aided design is a computer technology that designs a product and documents the design's process. By transferring detailed diagrams of a product’s materials, processes, tolerances and dimensions with specific conventions, CAD facilitates the manufacturing process. This hardware and software system is used to produce either two-dimensional or three-dimensional diagrams, enabling engineers and architects to design everything from furniture to airplanes. Engineers can view a design from any angle, zooming in or out for close-ups and long-distance views, while the computer keeps track of design dependencies.

Charge Coupled Device

ABBREVIATION [CCD]

A charge-coupled device is a photosensitive semiconductor device that transports electric charge from one capacitor to another, allowing serial output of parallel data. Typically used for digital image capture, its light-sensitive integrated circuit stores and displays the data for an image in such a way that each image pixel is converted into an electrical charge with the intensity of a color in the color spectrum. Systems supporting 65,535 colors have separate values for each color that can be stored and recovered. They are the most common image capture technology employed in modern optical microscopy.

ABBREVIATION [CEM]

Contract Electronics Manufacturer

Contract Electronics Manufacturers are companies that make electronics products under contract for other companies. They typically take on partial or whole manufacturing responsibility for original equipment manufacturers (OEMs).

Ceramic Multilayer Capacitor

ABBREVIATION [CMC]

Ceramic Multilayer Capacitors are monolithic devices that consist of laminated layers of specially formulated, ceramic dielectric materials interspersed with a metal electrode system. This formation is fired at high temperatures to produce sintered, volumetrically efficient capacitance devices, and a conductive termination barrier system is integrated on the exposed ends of the chip to complete the connection. Multilayer ceramic capacitors make up approximately 30% of the total components in a typical hybrid circuit module.

ABBREVIATION [CMOS]

Complementary Metal Oxide Semiconductor

Complementary Metal Oxide Semiconductor is an on-board, battery powered semiconductor chip that stores information inside computers. Its used in transistors that are manufactured into most of today's computer microchips. The standard lifetime of a CMOS battery is around 10 Years, depending on the use and environment in which the computer resides.

ABBREVIATION [COB]

Chip On Board

Chip On Board is used to refer to a configuration in which a chip is mounted directly onto printed circuit boards, and techniques used for such mounting. As part of this process, a bare chip that is mounted directly onto the printed circuit board. After wires are attached, a glob of epoxy or plastic is used to cover the chip and its connections.

ABBREVIATION [COF]

Chip On Flex

Chip on Flex refers to the mounting of flip chip components directly to flexible circuits. Lower product weight and size, cost and reliability risk can be achieved with Chip on Flex. Product shapes that would otherwise be difficult or impossible to produce economically without the use of a flexible substrate are made possible with Chip on Flex.

ABBREVIATION [COG]

Chip On Glass

Chip-On-Glass is a flip chip bonding technology for direct connection assembly of bare integrated circuits on glass substrate by using Anisotropic Conductive Film. It reduces the assembly area to the highest possible packing density, and allows cost-effective mounting of driver chips. Chip On Glass is a reliable and well established technology, often used in the automobile industry.

ABBREVIATION [CSP]

Chip Scale Package

A chip scale package is a type of integrated circuit package. Since being introduced, they've become one of the biggest packaging trends in recent history. Manufacturing advantages range from package size reduction and saving printed circuit board (PCB) routing space to self alignment characteristics during PCB assembly reflow and lack of bent leads which can cause coplanarity issues. CSPs are used to increase PCB assembly yields and lower manufacturing costs.

ABBREVIATION [CTE]

Coefficient of Thermal Expansion

Solids undergo maximum expansion when their surface temperature is increased by heating, and contract when they are cooled. This temperature change response is referred to as the coefficient of thermal expansion. It is the rate change in the size of an object with the rate change in the temperature.

ABBREVIATION [DCA]

Direct Chip Attach

See 'Chip On Board' definition. The general term for chip on board technology is direct chip attachment (DCA). Aside from circuit boards used for chip on boards (COBs), various substrates are available for use in DCAs.

ABBREVIATION [DIMM]

Dual Inline Memory Module

A Dual In-Line Memory Module is a printed circuit board that contains one or several random access memory chips on a small circuit board with pins that connect it to the computer motherboard. DIMMs have a 168-pin connector and support 64-bit data transfer. Instead of installing Single In-Line Memory Modules in-line pairs for synchronous dynamic RAM chips, a single DIMM can be used.

ABBREVIATION [DIP]

Dual Inline Package

Dual Inline Packages are integrated circuit packages with two rows of pins. These chips are encased in hard plastic with pins running along the outside.

ABBREVIATION [DRAM]

Dynamic Random Access Memory

Dynamic random access memory is a type of random-access memory used primarily in PC computing devices. DRAM stores each bit of data in a separate passive electronic component inside of an integrated circuit board. DRAM has one capacitor and one transistor per bit as opposed to static random access memory, which requires 6 transistors. The capacitors and transistors used in DRAM are exceptionally small—millions of capacitors and transistors can fit onto a single memory chip.

ABBREVIATION [DSP]

Digital Signal Processor

Digital Signal Processors mathematically manipulate real-world digitized signals like voice, audio, video, temperature, pressure, or position. DSPs are designed to perform mathematical functions very quickly, and their circuits can replace traditional analog functions, improving the accuracy and reliability of digital communications.

ABBREVIATION [EMC]

Electromagnetic Compatibility

Electromagnetic compatibility refers to the ability of electronic equipment and systems to operate in proximity of other electromechanical devices, without causing or suffering unacceptable output or performance degradation. Medical devices can be particularly vulnerable to electromagnetic interference if the levels of electromagnetic energy in its environment exceed the electromagnetic immunity of the device. That said, electromagnetic compatibility and interference affects all electronic devices.

ABBREVIATION [EMI]

Electromagnetic Interference

Electromagnetic interference is a phenomenon where an electromagnetic field interferes with another, resulting in the distortion of both fields. Many forms of naturally occurring and man-made EMI exist that can affect circuits and prevent them from working in the way that was intended. By understanding the source, coupling methods and susceptibility of the victim, EMI levels can be reduced to one where the interference doesn't cause performance degradation.

ABBREVIATION [ENIG]

Electroless Nickel Immersion Gold

Electroless nickel immersion gold is a surface plating used for printed circuit boards, consisting of an electroless nickel plating covered with a thin layer of immersion gold.

ABBREVIATION [EPROM]

Electrically Programmable Read Only Memory

Electrically Programmable Read Only Memory is a programmable read only memory whose contents can be changed.

ABBREVIATION [EEPROM]

Electrically Erasable Programmable Read Only Memory

Electrically Erasable Programmable Read Only Memory is a programmable read-only memory that can be erased and re-used.

ABBREVIATION [ESD]

Electrostatic Discharge

Electrostatic discharge is a swift discharge of electric current between two objects with different charges and numbers of electrons that creates a large electromagnetic field buildup. This build up can cause catastrophic damage in electrical equipment, or nearly undetectable upset failure. ESD has several causes, but static electricity and electrostatic induction are the most common. Certain electronic devices are vulnerable to low-voltage ESD.

Flip Chip

ABBREVIATION [FC]

Flip Chip is a chip packaging technique in which the active area of the chip is flipped over to face downward. Instead of being faced up and bonded to the package leads with wires from the outside edges of the chip, the entire surface area of the flip chip can be used for interconnection. This is typically done through metal bumps of solder, copper or nickel/gold that are soldered onto the package substrate or the circuit board itself and underfilled with epoxy. This allows for a large number of interconnects with shorter distances than wire, greatly reducing inductance.

ABBREVIATION [FPC]

Flexible Printed Circuit

Flexible Printed Circuits, although similar in name to printed circuit boards, should not be designed using the same rules as for PCBs. Flexible printed circuits consist of a metallic layer of traces bonded to a dielectric layer. FPCs can be classified as single sided circuits, double sided circuits and multi-layer circuits. Their packages tend to be smaller, lighter and more functional than traditional packages that use hardboard circuits.

ABBREVIATION [FPGA]

Field Programmable Gate Array

Field-programmable gate arrays (FPGAs) are integrated circuits that can be programmed in the field after manufacture. They're used by engineers in the design of specialized integrated circuits that can later be produced and hard-wired in large quantities. They consist of an array of logic elements, flip-flops and programmable interconnect wiring.

Fine Pitch Technology

ABBREVIATION [FPT]

Fine Pitch technology is an technology related to surface mount components that contain interconnections whose pitch is on the order of 0.2 to 0.65 mm.

ABBREVIATION [HASL]

Hot Air Solder Leveling

Hot air solder leveling is a finish used on printed circuit boards. The boards are dipped into a bath of molten solder, covering them completely.

ABBREVIATION [HDI]

High Density Interconnect

High density interconnects are printed circuit boards with higher wiring density per unit than more conventional printed circuit boards, making them lighter and smaller with enhanced electrical performance.

ABBREVIATION [ICT]

In Circuit Test

In Circuit Tests involve the testing of a populated circuit board by an electrical probe, ensuring that there are no shorts, opens, resistance, capacitance. Generally, it is done to confirm that the assembly was fabricated correctly.

ABBREVIATION [IGBT]

Insulated-Gate Bipolar Transistor

An Insulated Gate Bipolar Transistor is a minority-carrier device with high input impedance and large bipolar current-carrying capability.

ABBREVIATION [IPD]

Integrated Passive Device

Integrated Passive Devices are fabricated using standard wafer fab technologies such as thin film and photolithography processing. IPDs can be designed as flip chip mountable or wire bondable components and the substrates for IPDs usually are thin film substrates like silicon, alumina or glass. IPD technology offers the ideal trade-off for system in package integration.

ABBREVIATION [LB]

Lead Bonding

Lead Bonding is the joining of metallic parts to form an electrically conductive path that will ensure electrical continuity and the capacity to conduct any current to be present in a safe manner.

ABBREVIATION [LF]

Lead Frame

A lead frame is a common type of chip package utilizing metal leads, and providing external terminals and mechanical support to align them. This metal structure carries electrical signals from the die to the outside.

ABBREVIATION [LDI]

Laser Direct Imaging

Laser direct imaging support the digital printed circuit board production process. Computer control operated, LDI can write patterns onto high sensitivity resists. They provide high resolution results with easy processing.

ABBREVIATION [LPI]

Liquid Photo Imageable

Liquid Photo Imageable is a liquid ink comprised of two components mixed together just before application, resulting in a coating that adheres to printed circuit board surfaces. It's designed primarily for spray, screenprint and curtain coat applications.

ABBREVIATION [MCM]

Multi Chip Module

A multi-chip module is an electronic package consisting of multiple integrated circuits assembled into a single device. MCMs work as a single component and are capable of handling entire functions. Reducing the size of devices, they're encapsulated by plastic molding and mounted onto circuit boards.

ABBREVIATION [MELF]

Metal Electrode Leadless Face

Metal electrode leadless face is a type of leadless cylindrical electronic surface mount device that is metallized at its ends. MELF devices are usually resistors and diodes.

ABBREVIATION [MID]

Molded Interconnection Device

Molded interconnect devices are merge the circuit board, housing, connectors, and cables that comprise traditional product interfaces into fully functional, compact parts. These 3-dimensional electromechanical parts bring together mechanical and electrical engineering.

ABBREVIATION [MOSFET]

Metal Oxide Semiconductor Field Effect Transistor

A Metal-Oxide Semiconductor Field-Effect Transistor is a special type of field-effect transistor that works by electronically varying the width of a channel along which charge carriers flow. Charge carriers enter the channel at the source, and exit via the drain. The width of the channel is controlled by the voltage on an electrode called the gate that's located between the source and the drain, and insulated from the channel by an extremely thin layer of metal oxide.

ABBREVIATION [OSP]

Organic Solderability Protective

Organic solderability preservative is a method for coating of printed circuit boards. OSP uses a water-based organic compound that selectively bonds to copper and protects it until soldering. Compounds typically used in OSPs are from the azole family.

Passive Electronic Components

There are two classes of electronic components – Active and Passive. Passive components are electronic components that don't require a source of energy to perform their intended functions. Such component types don't have the ability to control currents by means of another electrical signal. Examples of passive component types include resistors, capacitors, inductors, and diodes.

ABBREVIATION [P-LCC]

Plastic Leaded Chip Carrier

A Plastic Leaded Chip Carrier is a square surface mount chip package in plastic with pins on all four sides.

ABBREVIATION [P-QFP]

Plastic Quad Flat Pack

A Plastic Quad Flat Pack is a type of integrated circuit packaging technology that allows gull wing pins to extend from all four sides of the body.

ABBREVIATION [P-SO]

Plastic Small Outline

Plastic Small Outlines include JEDEC standard compliance, footprint and height 50% of DIP, two side leaded for routing simplicity, 50 mil (1.27 mm) pitch for SMT simplicity, and gull wing formed leads for improved surface mount technology manufacturing.

ABBREVIATION [P-TSOP]

Plastic Thin Small Outline Package

Plastic Thin Small Outline Packages are a type of surface mount integrated circuit package. They are very low-profile (about 1mm) and have tight lead spacing (as low as 0.5mm), frequently used for RAM and Flash memory ICs. They have a high pin count and are small volume.

ABBREVIATION [PCB]

Printed Circuit Board

A printed circuit board is an electronic circuit consisting of thin strips of conducting material such as copper. Integrated circuits and other components are attached to this flat insulating sheet.

ABBREVIATION [PTH]

Plated Through Hole

Through-hole technology refers to a mounting scheme involving the use of leads on components inserted into holes drilled into printed circuit boards and soldered to pads on the opposite side either by manual assembly or with the use of automated insertion mount machines.

ABBREVIATION [QNF]

Quad Flat No-Leads

Quad Flat No-Leads physically and electrically connect integrated circuits to printed circuit boards.

ABBREVIATION [QFP]

Quad Flat Pack

A quad flat package is a surface mount integrated circuit package with gull wing leads extending from its four sides. Socketing such packages is rare. Through-hole mounting of this package is not possible.

ABBREVIATION [RCC]

Resin Coated Copper

Resin-Coated-Copper films can be laminated on assembled chips and components, providing the polymer dielectric matrix for further 3D package processing.

ABBREVIATION [SIP]

Single Inline Package

A single inline package is a computer chip package that contains only a single row of connection pins. This is different from dual inline packages, which have two rows of connected pins.

ABBREVIATION [SiP]

System In a Package

A System In A Package is a number of integrated circuits enclosed in a single module. The SiP performs all or most of the functions of an electronic system, and is typically used inside of mobile phones and digital music players.

ABBREVIATION [SIMM]

Single Inline Memory Module

A single in-line memory module (SIMM) is a module containing one or several random access memory (RAM) chips on a small circuit board with pins that connect to the computer motherboard.

ABBREVIATION [SIR]

Surface Insulation Resistance

Surface Insulation Resistance is the electrical resistance of an insulating material between a pair of contacts, conductors, or grounding devices, which is determined under specific environmental and electrical conditions.

ABBREVIATION [SMD]

Surface Mount Device

A surface mount device is an electronic device made by producing electronic circuits where components are mounted directly onto the surface of printed circuit boards.

ABBREVIATION [SMT]

Surface Mount Technology

Surface-mount technology is a method for producing electronic circuits in which the components are mounted or placed directly onto the surface of printed circuit boards.

ABBREVIATION [SOC]

System On a Chip

A system-on-a-chip is a microchip with all the necessary electronic circuits and parts for a given system, such as a smartphone or wearable computer, on a single integrated circuit.

ABBREVIATION [SOD]

Small Outline Diode

Small Outline Diode is a designation for a group of semiconductor packages for surface mounted diodes.

ABBREVIATION [SODIMM]

Small Outline Dual Inline Memory Module

A small outline dual in-line memory module is a type of computer memory built using integrated circuits. SO-DIMMs are a smaller alternative to DIMMs, roughly half the size of regular DIMMs.

ABBREVIATION [SOIC]

Small Outline Integrated Circuit

A Small Outline Integrated Circuit is a surface-mounted integrated circuit package that occupies an area about 30–50% less than equivalent dual in-line packages, and with 70% less thickness typically. They are generally available in the same pin-outs as their counterpart dual in-line package integrated circuits.

ABBREVIATION [SOJ]

Small Outline J-Lead

A Small Outline J-Lead integrated circuit is a surface mount component that contains j-style pins on either side of the body.

Statistical Process Control

ABBREVIATION [SPC]

Statistical Process Control is an industry-standard methodology for measuring and controlling quality during the manufacturing process. Quality data in the form of product or process measurements are obtained in real-time during manufacturing. This data is then plotted on a graph with pre-determined control limits. Control limits are determined by the capability of the process, whereas specification limits are determined by the client's needs.

ABBREVIATION [SSOP]

Shrink Small Outline Package

Shrink small outline package chips have gull wing leads protruding from two long sides, and a lead spacing of 0.0256 inches (0.65mm). 0.5mm lead spacing is less common, but not rare.

ABBREVIATION [TAB]

Tape Automated Bonding

Tape-automated bonding is a process that places bare integrated circuits onto a printed circuit board by attaching them to fine conductors in a polyamide or polyimide film. This provides a means to directly connect to external circuits.

ABBREVIATION [TCP]

Tape Carrier Package

The Tape Carrier Package component consists of the device interconnected to a 3 layer tape automated bonding tape. The interconnects are copper. The tape carrier film is polyimide. An advanced epoxy-based adhesive system is used.

ABBREVIATION [THM]

Through Hole Mounting

Through-hole mounting is the process by which component leads are placed into drilled holes on a bare printed circuit board. This process was standard until the rise of surface mount technology in the 1980s. Despite its drop in popularity, through-hole technology is still used within niche applications due to its reliability.

ABBREVIATION [TO]

Transistor Outline

Transistor Outline packages are stamped, coined or drawn metal components with standard dimensional outlines commonly used in the semiconductor industry for the hermetic packaging of integrated circuits.

ABBREVIATION [TSOP]

Thin Small Outline Package

A type of surface mount integrated circuit package, a Thin Small Outline Package is a rectangular, thin bodied component. They are very low-profile (about 1mm) and have tight lead spacing (as low as 0.5mm). They are frequently used for RAM and Flash memory integrated circuits due to their high pin count and small volume.

ABBREVIATION [ZIF]

Zero Insertion Force

Zero insertion force is a type of integrated circuit socket or electrical connector that requires very little force for insertion. With a ZIF socket, before the integrated circuit is inserted, a lever on the side of the socket is moved pushing all the sprung contacts apart so that the IC can be inserted with very little force. The lever is then moved back, allowing the contacts to close and grip the pins of the IC.

ABBREVIATION [ZIP]

Zigzag Inline Package

Zig-zag in-line package is an integrated circuit encapsulated in a slab of plastic with 20 or 40 pins, measuring (for the ZIP-20 package) about 3 mm x 30 mm x 10 mm. The package's pins protrude in two rows from one of the long edges. The two rows are staggered by 1.27 mm (0.05"), giving them a zig-zag appearance, and allowing them to be spaced more closely than a rectangular grid would allow. The pins are inserted into holes in a printed circuit board, with the packages standing at right-angles to the board, allowing them to be placed closer together than DIPs of the same size. They’re commonly used for dynamic RAM chips.