

Actuator: Causes mechanical force or motion in response to an electrical signal.

Analog: Refers to electrical signals that can vary continuously over a range, as compared to digital signals, which are restricted to a pair of nominally discrete values.

Angstrom: One tenth of a nanometer, 10^{-10} meters.

Architecture: The overall logic structure of a computer or computer-based system.

Capacitor: Passive circuit element that stores electrical charge, creating a voltage differential. Capacitors can be fabricated within integrated circuits, as well as in the form of discrete components.

Charge-Coupled Devices (CCD): A type of solid-state electronic device used as a sensor in some types of cameras.

Circuit Board: A card or board of insulating material on which components such as semiconductor devices, capacitors, and switches are installed.

Clock An electronic circuit, often an integrated circuit, that produces high-frequency timing signals. A common application is synchronization of the operations performed by a computer or microprocessor-based system. Typical clock rates in microprocessor circuits are in the megahertz range, 1 megahertz equaling 10^6 cycles per second.

Compact Disk (CD): An optical storage medium used for music and for computer data, among others.

Deposition: An operation by which a film is placed on a surface.

Die Bonder: Assembly equipment that bonds the back side of an integrated circuit die to various materials. A die is a small piece of silicon wafer that contains the complete circuit being manufactured.

Doping: Adding to a semiconducting material small amounts of other elements (dopants) to change its electronic properties.

Dynamic Random Access Memory (DRAM): The most common type of computer memory. DRAM architecture usually uses one transistor and a capacitor to represent a bit, which is a memory cell in a computer.

Electron Cyclotron Resonance (ECR): A technology that uses a high-frequency microwave energy source to create a plasma in a confined region using a magnetic field for the purpose of etching and deposition.

Etching: A process in which chemicals are used to remove previously defined portions of the silicon oxide layer covering the wafer to expose the silicon underneath.

Flat Panel Displays: A thin display screen that uses any of a number of technologies, such as liquid crystal display. Flat panel displays are used in laptop computers in order to keep the overall size and weight of the machine to a minimum.

Gallium Arsenide (GaAs): A compound semiconductor with properties necessary for very high-frequency microwave (analog) devices and optoelectronics.

Gate: A simple electronic circuit that can implement a specified logical operation. In essence, gates act like switches. Computer processing units depend on large assemblies of gates, as do integrated circuit memory chips.

Integrated Circuit (IC): Electronic circuits, including transistors, resistors, capacitors, and their interconnections, fabricated on a single small piece of semiconductor material (chip). Categories of ICs such as LSI and VLSI refer to the level of integration, which denotes the number of transistors on a chip. ICs may be digital (logic chips, memory chips, or microprocessors) or analog.

Ion Implantation: A process in which silicon is bombarded with high-voltage ions in order to implant them in specific locations and provide the appropriate electronic characteristics.

Liquid Crystal Display (LCD): A liquid crystal display is a technique that uses a transistor for each monochrome or each red, green and blue dot. It provides sharp contrast and speeds screen refresh. LCD technology is commonly used in digital watches and laptop computers.

Lithography A process in which the desired circuit pattern is projected onto a photoresist coating covering a silicon wafer. When developed, portions of the resist can be selectively removed with a solvent, exposing parts of the wafer for etching and diffusion.

Logic **Chips:** ICs that manipulate digital data.

LSI: Large-scale integration. Typically involving between 2,000 and 64,000 transistors.

Mainframe Computer: A system, normally intended for general-purpose data processing, characterized by high performance and versatility. Mainframes have grown steadily in capability as smaller and less expensive machines have progressed.

Mask: Stencil-like grid used in creating lithographic patterns on semiconductor chips.

Mass Storage: Refers to peripheral equipment for computer memory suitable for large amounts of data or for archival storage. Typical mass storage devices are disk and tape drives.

Memory Chips: Devices for storing information in the form of electronic signals.

Microcomputer: Refers to integrated circuits that contain a microprocessing unit plus memory, as well as to computers designed around microprocessors or single-chip microcomputers.

Micrometer: One-millionth of a meter.

Micron: One-millionth of a meter.

Microprocessor: A computer central processing unit on a single chip.

Nanometer: One-billionth of a meter.

Optical Disks: Recording media including CDs that store information in patterns of microscopic pits on the surface of the disk, which can then be detected by a solid state laser and detector system and reproduced as sound, images, or data.

Optoelectronic Devices: Devices that convert light signals to electronic signals and vice versa.

RAM (Random Access Memory): Most commonly, an integrated circuit that stores data in such form that it can be read, erased, and rewritten under the control of a computer processor. Any memory location in a RAM can be addressed directly (random access) as opposed to sequentially or serially.

Resist, Photoresist: Chemicals used in lithographic processing of integrated circuits which, much like photographic emulsions, can be exposed by light, X-rays, or other radiation to form patterns.

Semiconductors: Materials, e.g., silicon, that have four electrons in their outer electron shells and have electrical conductivities that are lower than good conductors such as metals but higher than insulators such as glass. Other semiconductors include germanium, gallium arsenide (GaAs), indium phosphide (InP), mercury telluride (HgTe), cadmium telluride (CdTe), and alloys of these compound semiconductors.

Sensor: Converts a pressure, temperature, or other physical parameter into an electrical signal, often for use in a control system. A digital speedometer for an automobile transforms the output of a sensor into a miles-per-hour reading, as does an airplane's air speed indicator. In the case of the automobile speedometer, rotary motion is converted into an electrical signal, while an air speed indicator depends on the pressure created by the motion of the airplane.

Silicon: One of the most common elements found in nature and the basic material used to make the majority of semiconductor wafers.

Stepper: A sophisticated piece of equipment used to transfer an integrated circuit pattern from a mask onto a wafer.

Substrate: A piece of material, typically a semiconductor, on which layers of materials are deposited and etched to fabricate a device or a circuit.

Transistor: An electronic device that can be used to switch or amplify electronic signals.

VLSI: Very large-scale integration. Typically involving more than 64,000 transistors.

Wafer: A thin disk, cut from silicon or other semiconductor material. The wafer is the base material on which integrated circuits are fabricated. It is typically 4 to 8 inches in diameter.

Yield: In the production of microelectronic devices, the fraction that survive all tests and inspection, function correctly, and can be sold or incorporated into the manufacturer's own end products. Production costs depend heavily on yields, which themselves depend on circuit design, fabrication equipment, and control of the manufacturing process.