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Tunnel diode logic TDL Exactly the same as diode logic but can perform at a higher speed. Core diode logic CDL Performed by semiconductor diodes and small ferrite toroidal cores for moderate speed and moderate power level. Direct-coupled transistor logic DCTL Uses transistors switching between saturated and cutoff states to perform logic. The transistors require carefully controlled parameters. Economical because few other components are needed, but tends to be susceptible to noise because of the lower voltage levels employed. Often considered to be the father to modern TTL logic. Current-mode logic CML Uses transistors to perform logic but biasing is from constant current sources to prevent saturation and allow extremely fast switching. Has high noise immunity despite fairly low logic levels. Quantum-dot cellular automata QCA Uses tunnelable q-bits for synthesizing the binary logic bits. The electrostatic repulsive force in between two electrons in the quantum dots assigns the electron configurations that defines high-level logic state 1 or low-level logic state 0 under the suitably driven polarizations. This is a transistorless, currentless, junctionless binary logic synthesis technique allowing it to have very fast operation speeds. Electronic logic gates differ significantly from their relay-and-switch equivalents. They are much faster, consume much less power, and are much smaller all by a factor of a million or more in most cases. Also, there is a fundamental structural difference. The switch circuit creates a continuous metallic path for current to flow in either direction between its input and its output. The semiconductor logic gate, on the other hand, acts as a high-gain voltage amplifier, which sinks a tiny current at its input and produces a low-impedance voltage at its output. It is not possible for current to flow between the output and the input of a semiconductor logic gate. Another important advantage of standardized integrated circuit logic families, such as the and families, is that they can be cascaded. This means that the output of one gate can be wired to the inputs of one or several other gates, and so on. Systems with varying degrees of complexity can be built without great concern of the designer for the internal workings of the gates, provided the limitations of each integrated circuit are considered. When gates are cascaded, the total propagation delay is approximately the sum of the individual delays, an effect which can become a problem in high-speed circuits. Additional delay can be caused when a large number of inputs are connected to an output, due to the distributed capacitance of all the inputs and wiring and the finite amount of current that each output can provide. In an letter, Charles Sanders Peirce described how logical operations could be carried out by electrical switching circuits. Ludwig Wittgenstein introduced a version of the row truth table as proposition 5. Walther Bothe, inventor of the coincidence circuit, got part of the Nobel Prize in physics, for the first modern electronic AND gate in Konrad Zuse designed and built electromechanical logic gates for his computer Z1 from 1938 to 1941, NEC engineer Akira Nakashima introduced switching circuit theory in a series of papers showing that two-valued Boolean algebra, which he discovered independently, can describe the operation of switching circuits. Shannon, who elaborated on the use of Boolean algebra in the analysis and design of switching circuits in Switching circuit theory became the foundation of digital circuit design, as it became widely known in the electrical engineering community during and after World War II, with theoretical rigor superseding the ad hoc methods that had prevailed previously. The "distinctive shape" set, based on traditional schematics, is used for simple drawings, and derives from MIL-STD of the S and s. It is sometimes unofficially described as "military", reflecting its origin. The mutual goal of IEEE Std and IEC was to provide a uniform method of describing the complex logic functions of digital circuits with schematic symbols. They could be medium scale circuits such as a 4-bit counter to a large scale circuit such as a microprocessor. IEC and its successor IEC do not explicitly show the "distinctive shape" symbols, but do not prohibit them. Usage of these other symbols in combination to form complex symbols for example, use as embedded symbols is discouraged. A third style of symbols was in use in Europe and is still widely used in European academia. In the S, schematics were the predominant method to design both circuit boards and custom ICs known as gate arrays.

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