

IC history timeline -- milestones in IC technology  
by Jeff Drobman (c) 2015

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<http://spectrum.ieee.org/static/special-report-50-years-of-moores-law>

<http://spectrum.ieee.org/geek-life/history/moores-law-milestones>

<http://www.computerhistory.org/semiconductor/timeline.html>

1947 - transistor invented (Bell Labs trio of Bardeen, Brattain & Shockley) - point contact form

1951 - Bipolar junction transistor (BJT) invented by Wm Shockley

1956 - **Shockley Semiconductor Laboratory** founded as a division of Beckman Instruments, Inc. Shockley hires his PhD students Noyce & Moore.

1957 - the "Traitorous 8" semiconductor engineers leave Shockley Labs and found **Fairchild Semiconductor** as a division of Fairchild Camera & Instrument Corporation.

Sep 1958 - Jack St. Clair Kilby tests the world's first integrated circuit. The single-transistor oscillator is built on a chip of germanium in a lab at Texas Instruments.

Mar 1959 - Jean Hoerni of Fairchild demos his "planar process" (world first). Then Bob Noyce of Fairchild documents a method for building ICs using that planar process.

Aug 1959 - Noyce puts Jay Last in charge of a group at Fairchild to make ICs.

May 1960 - Fairchild group makes first IC.

[Note: Courts and the tech community decided to give equal rights to the invention of the IC to both Kilby and Noyce]

1960 - MOS invented: first MOSFET amplifier demonstrated.

1963 - standard logic families are introduced using DTL and TTL structures.

1963 - CMOS process was invented by a pair of Fairchild Semiconductor in a 1963 paper and patent.

RCA Research Labs built the first known CMOS parts in 1965, and an SRAM in 1968. Through the 1970s, a few others, including HP developed a form of CMOS built on sapphire substrates called CMOS/SOS, along with a more standard form using silicon substrates. The HP CMOS process was taken to a new startup in 1980 to make SRAMs in CMOS: Integrated Device Technology. TI was the first major semiconductor manufacturer to go into production with CMOS, along with Intel. Intel had a CMOS process for use with its x86 microprocessors by 1980. AMD struggled for several more years to develop their CMOS. AMD hired TI's chief CMOS developer, TJ Rodgers, to help AMD design a CMOS process, but VC Ben Rosen lured TJ away to start up a new chip maker, Cypress Semi in 1982. IDT and Cypress have been strong rivals in CMOS logic, SRAM and microprocessors since the 1980s and 1990s.

1964 - First MOS products released by General Microelectronics for a calculator chipset.

1964 - First analog ICs introduced by Fairchild Semiconductor.

April 1965 - Moore's Law born - Gordon Moore publishes his first version of his "Law" that transistor counts on ICs will double -- initially here every ONE year (revised in 1975 to TWO years).

1965 - First semiconductor ROM memory devices.

1965 - DIP (dual in-line) packages introduced.

1966 - Bipolar RAMs (SRAM) introduced.

1966 - IBM researcher Robert Dennard conceives of the DRAM cell (1T/1C),

1968 - Intel is founded, and begins designing first "LSI" devices: the 1101 256-bit DRAM, soon followed by the 1K-bit 1103.

1969 - AMD is founded (May) by 8 Fairchild execs, managers and engineers, led by WJ "Jerry" Sanders as CEO, to start up as a declared "second source" to Fairchild products (linear and digital).

April 1970 - Intel begins design of the world's first microprocessor, the 4-bit i4004. It was built on a 10um process on 2-inch wafers, with 2,250 transistors and ran at 108 kHz. It was soon followed by an 8-bit version called the i8008, later revised into the first successful microprocessor, the i8080.

June 1972 - ion implantation begins use in making ICs, replacing chemical diffusion.

1973 - fab equipment is introduced to automate IC manufacturing: Perkin-Elmer's projection scanner is the first use of "photolithography" -- the mainstay of the semiconductor industry.

1974 - First digital watch IC (SoC), using LCD display.

1978 - the "wafer stepper" is introduced to further automate IC manufacturing.

1978 - PAL - first programmable logic devices

1979 - Integrated Device Technology is founded by 3 HP process engineers. AMD founder John Carey is chief investor and then chairman, who subsequently brought over many top AMD guys.

March 1984 - Xilinx develops first FPGA; co-founder Ross Freeman is credited.

Dec 1984 - Flash EEPROM memory devices are introduced.

Feb 1987 - TSMC is founded and launches the IC foundry model.

Dec 1997 - IBM and Motorola introduce copper to replace aluminum for interconnects.

Oct 2002 - Intel introduces its first 300mm (12 inch) wafer fab, replacing the 200mm (8 inch) wafer.

May 2011 - Intel introduces its first "FinFET" transistor structure -- a more vertical structure that produces a xtor structure half the size.