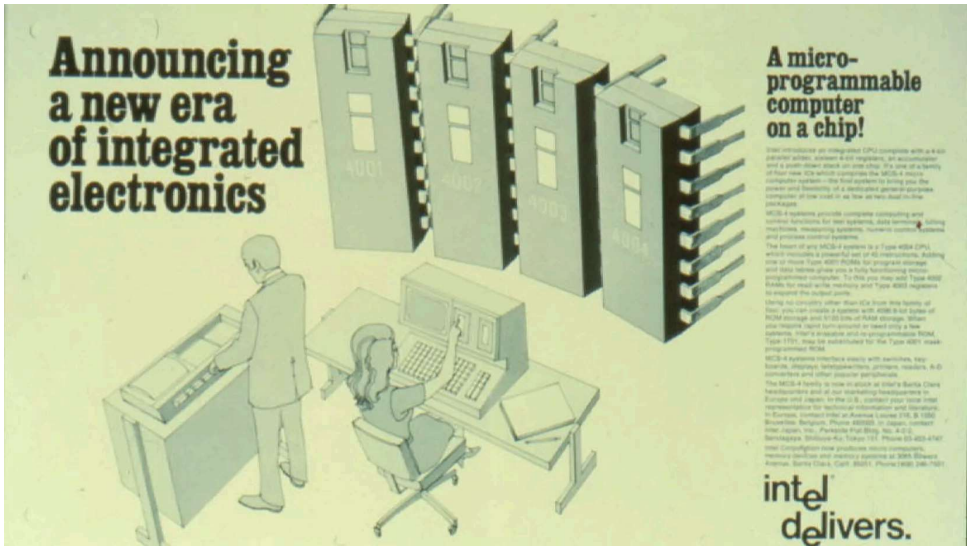
Announcing a New Era of Integrated Electronics

The Intel 4004

At A Glance

- 1971
- Intel's 4004 microprocessor began as a contract project for Japanese calculator company Busicom. Intel repurchased the rights to the 4004 from Busicom for a fraction of the device's eventual value.
- The 4004 would be one of the most important conceptual breakthroughs of the 1900s: a programmable logic microchip.

In April 1969, Japanese calculator company Busicom asked Intel to build a twelve-chip set to handle the operations for a desktop calculator. Intel considered itself a memory chip company at the time, but it had been operative less than two years and accepted the Busicom contract rather than forgo a business development opportunity. However, when Intel engineer Ted Hoff began work on the project, he quickly realized that Busicom's design concept was too cumbersome to operate properly. He set out to create an alternative, and the project he launched would lead to one of the most important inventions in the history of information technology: the Intel 4004 programmable microprocessor.



Intel 4004 print ad

At the time of the Busicom contract, all chips had their logic programming custom-built into their physical architecture, an approach that made their research and development prohibitively expensive, which created a shortage of engineers and made devices comparatively large and cumbersome.

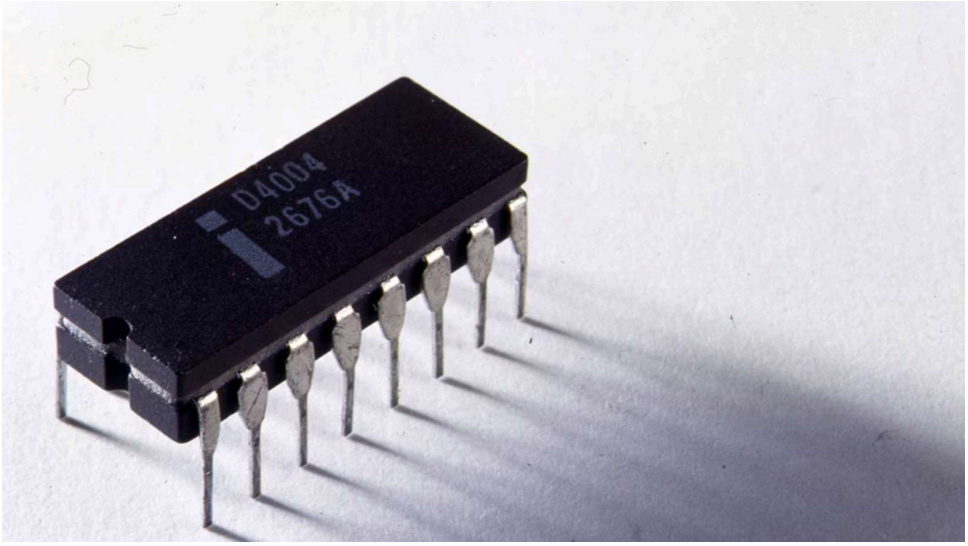
The 4004 would replace that system with a general-purpose chip that could be mass produced and then programmed through its software to perform specific functions, such as those of a desktop calculator. That idea could make computing cheaper, more powerful and smaller in one fell swoop. It could, in other words, facilitate the modern information age.

In 1969, the Nippon Calculating Machine Corporation approached Intel to design 12 custom chips for its new Busicom 141-PF printing calculator. Intel's engineers proposed a new design of just four chips, including one that could be programmed for use. That programmable chip, later known as the Intel 4004, became the first general-purpose microprocessor.

Hoff, Federico Faggin (who took over design leadership from Hoff) and Stan Mazor at Intel, along with Masatoshi Shima from Busicom, all contributed to making the ambitious concept a reality. (Shima later joined Intel.) They finished the four-chip 4000 series, which included the 4004 microprocessor, by early 1971. Hoff later discussed the chip's impact:

> *People were ... locked into the concept that a computer was a precious, multi-million- dollar piece of equipment. ... With this product, we changed people's perception of computers and the direction that the computing industry would go. We democratized the computer.*

Ironically, Busicom — who owned the exclusive rights to the world-changing device — was unhappy with it. The bottom had fallen out of the desktop calculator market during the 4004's development, so Busicom wanted to renegotiate the price for the product. In May 1971, at the urging of the 4004's design team, Intel CEO Robert Noyce repurchased rights to the chip for everything but calculators in exchange for returning Busicom's $60,000 investment in its development.



Intel's first microprocessor, the 4004, released in 1971.

Busicom wound up going bankrupt in 1974. Intel went on to become a global powerhouse with nearly $60 billion in annual revenue in 2017, all of which stemmed to some extent from the microprocessor industry the company established and the modern age that came with it.

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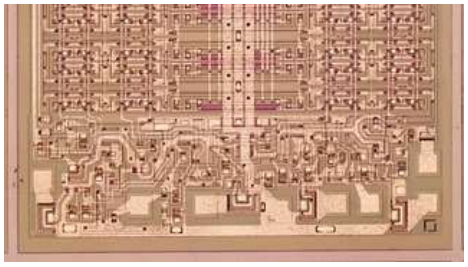

Intel's First Product – the 3101

Less than a year after starting, Intel introduced its first product: the 3101 static random-access memory (SRAM).

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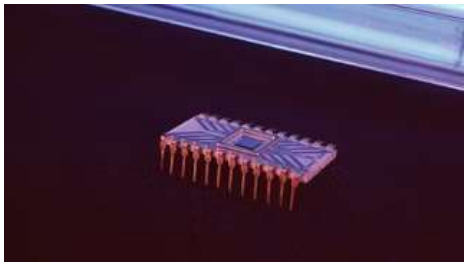

A Success...Out of Quality Control Issues

EPROM derived from discoveries Dov Frohman made while troubleshooting the 1101 static random-access memory and Frohman's readiness to pursue those discoveries.

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