Moore's Law: Raising the Bar

Nearly 40 years ago, Intel co-founder Gordon Moore forecasted the rapid pace of technology innovation. His prediction, popularly known as "Moore's Law," states that transistor density on integrated circuits doubles about every two years. Today, Intel continues to lead the industry, driving Moore's Law to increase functionality and performance and decrease costs, bringing growth to industries worldwide.

Intel also applies the power of its silicon expertise to deliver the benefits of Moore's Law, helping the company meet rapidly changing demands for new capabilities, transparent ease-of-use, and even lower costs. Intel is expanding Moore's Law into areas beyond traditional computing — driving architectural innovation for future platforms.

Microprocessor	Year of Introduction	Transistors
4004	1971	2,300
8008	1972	2,500
8080	1974	4,500
8086	1978	29,000
Intel286	1982	134,000
Intel386™ processor	1985	275,000
Intel486™ processor	1989	1,200,000
Intel® Pentium® processor	1993	3,100,000
Intel® Pentium® II processor	1997	7,500,000
Intel® Pentium® III processor	1999	9,500,000
Intel® Pentium® 4 processor	2000	42,000,000
Intel® Itanium® processor	2001	25,000,000
Intel® Itanium® 2 processor	2002	220,000,000
Intel® Itanium® 2 processor (9MB cache)	2004	592,000,000

"Another decade is probably straightforward…There is certainly no end to creativity."

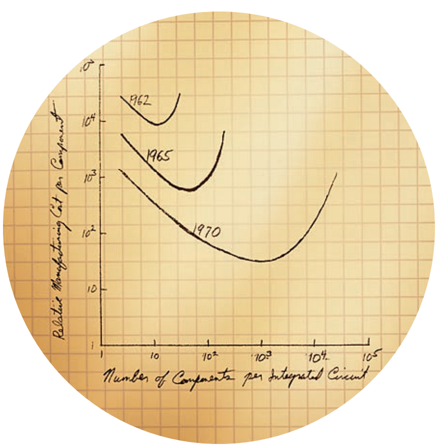
**Gordon Moore, Intel Chairman Emeritus of the Board
Speaking of extending Moore's Law at the
International Solid-State Circuits Conference (ISSCC),
February 2003.**

Moore Optimistic on Moore's Law

In 1965 Gordon Moore made a prediction about the semiconductor industry that has become the stuff of legend. Known as Moore's Law, that prediction has enabled widespread proliferation of silicon technology worldwide, and today has become shorthand for rapid technological change.

Moore predicted the exponential growth that has driven the semiconductor industry from startup some 50 years ago to more than $200 billion in annual revenue today. Circuits have also become the foundation of the trillion-dollar electronics industry. As integrated circuit costs have decreased, they have made their way into modern products ranging from automobiles to greeting cards.

Moore, in addressing the 2003 International Solid-State Circuits Conference (ISSCC*), discussed some of the coming trends in the semiconductor industry, as well as some of the challenges going forward. For the computer industry, many of the exponential trends are approaching limits that require new solutions if the historic rate of progress is to continue.



In 1965, Gordon Moore sketched out his prediction of the pace of silicon technology. Decades later, Moore's Law remains true, driven largely by Intel's unparalleled silicon expertise.

New Technologies Address Challenges

Several times in the past, it appeared that technological barriers such as power consumption would slow or even halt the growth trends, but Intel found ways around the barriers with continued innovation. But Moore says a new, more fundamental barrier is emerging — that the technology is approaching atomic dimensions, raising all sorts of new challenges. Intel is already working on technologies that will also overcome this barrier.

A key to ensuring that Moore's Law continues is that transistors must evolve from the planar (flat) structure generally used today. Many new ideas have been proposed to solve the evolving issues. One radical proposal currently being studied involves a three-dimensional, tri-gate transistor. These new transistors achieve higher performance with greater power efficiency than traditional planar transistors and are designed so that they can continue to be scaled down while being reasonably simple to manufacture.

There are many ways to solve the issues that the industry now faces. The resourceful engineers and scientists in the semiconductor industry have faced previous challenges and risen to the occasion, and they will do so again.

For at least several more generations, new approaches should propel progress at roughly the same rate at which it has moved historically. But Moore says that even if doubling times stretch in the future, the rate of progress in the semiconductor industry will far surpass that of nearly all other industries.