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Robert H. Dennard, Developer of Dynamic Random Access Memory, to Receive 2009 IEEE Medal of Honor

Contributions to Microelectronics Have Made Increased Computing Power and Communications Tools Accessible to the Masses

PISCATAWAY, N.J. – 22 June 2009 – Robert H. Dennard, an engineer whose invention of DRAM, along with development of the MOSFET scaling theory, are among the most influential and visible developments in all of microelectronics, is being honored by IEEE with the 2009 IEEE Medal of Honor. IEEE is the world's largest technical professional society.

The medal, sponsored by the IEEE Foundation, recognizes Dennard for his invention of the single-transistor dynamic random access memory and for developing scaling principles for integrated circuits. The medal will be presented on 25 June 2009 at the IEEE Honors Ceremony in Los Angeles, Calif. For the first time, the IEEE Honors Ceremony will be broadcast live on the Web through IEEE.tv (www.ieee.tv).

Dynamic random access memory (DRAM) is used by all computer component and system manufacturers. It consists of an array of memory cells integrated on a silicon chip in which each cell consists of a metal-oxide-semiconductor (MOS) transistor and a capacitor in the same MOS technology. Information is stored as a charge on the capacitor and the transistor is used to control reading and writing. This arrangement requires less power and costs much less than the previous magnetic memory and also is less complex and therefore denser than the other semiconductor memory cells previously developed.

Dennard's pioneering DRAM invention brought about far-reaching and fundamental changes in science and technology, impacting a broad range of industries from aviation to telecommunications. He was granted a patent for DRAM in 1968 and it first began to appear in products in the 1970s. At the time of Dennard's invention, the largest memory configuration in a computer was one Megabyte, requiring kilowatts of power, while one to two Gigabytes of DRAM is common today, requiring only several watts of power. DRAM is a major part of the semiconductor industry in volume, with revenue of about US$25 billion a year and world demand for DRAM is growing about 60 percent per year.

Dennard's development of scaling theory has also been a driving force in microelectronics. In the early 1970s, Dennard and coworkers originated the concept of MOS transistor and circuit scaling that provides for systematic reduction of MOS integrated circuit dimensions and predicts the benefits of such reduction in improved speed, lower power and greater density. They showed how to design devices and build highly integrated circuits at the micron level at a time when the industry used much larger dimensions. In the 1980s he led a group which generalized the scaling principles and showed how to design devices down to submicron dimensions with further improvements in performance and density. The scaling concept gave practical results

that led the way from the five-micron devices of the early 1970s to today's 0.045-micron devices used in the Gigabit memory chips and powerful microprocessors currently being manufactured.

An IEEE Life Fellow and member of the National Academy of Engineering and the American Philosophical Society, Dennard holds 52 U.S. patents and has received many honors including the IEEE Cledo Brunetti Award in 1982, the IEEE Edison Medal in 2001, the National Medal of Technology in 1988 and induction into the National Inventors Hall of Fame in 1997. He received bachelor's and master's degrees in electrical engineering from Southern Methodist University, Dallas, Texas, and a doctorate from Carnegie Institute of Technology (now Carnegie Mellon University), Pittsburgh, Pa. Dennard is an IBM Fellow at the IBM Thomas J. Watson Research Center in Yorktown Heights, New York, where he continues to investigate the limits of scaling and future evolution of microelectronics. In 2009, Dr. Dennard was named recipient of the Charles Stark Draper Prize by the National Academy of Engineering.

About IEEE

IEEE, the world's largest technical professional association, is commemorating its 125th anniversary in 2009 by Celebrating 125 Years of Engineering the Future around the globe. Through its more than 375,000 members in 160 countries, IEEE is a leading authority on a wide variety of areas ranging from aerospace systems, computers and telecommunications to biomedical engineering, electric power and consumer electronics. Dedicated to the advancement of technology, IEEE publishes 30 percent of the world's literature in the electrical and electronics engineering and computer science fields, and has developed nearly 900 active industry standards. The organization annually sponsors more than 900 conferences worldwide. Additional information about IEEE can be found at http://www.ieee.org.