SEMICONDUCTOR INDUSTRY ASSOCIATION

THE IMPORTANCE OF FEDERAL SEMICONDUCTOR R&D FUNDING

Federal funding for semiconductor-related research and development (R&D) has for decades spurred industry breakthroughs that have led to everyday commercial innovations that have grown our economy, propelled U.S. technology leadership, and contributed to our national security.

A proven model: federal funding for semiconductor related R&D stimulates industry R&D which leads to commercial innovation

MANY OF TODAY'S COMMERCIAL INNOVATIONS WOULD NOT EXIST WITHOUT INITIAL FEDERALLY FUNDED R&D PROGRAMS

Several federally funded programs over the decades have helped the industry overcome innovation challenges and ultimately benefit society:

- The DOE-funded National Extreme Ultraviolet Lithography Program (NEUVLP) from 1994-1996 helped provide the foundation for advances in optical lithography that enabled the industry to continue to innovate. The NEUVLP spurred the commercial market to invest in making EUVL commercially viable which it became in 2000. EUVL technology extended the pace of Moore' Law and has enabled more powerful commercial products such as PCs and smartphones over the past 20 years.

- A DARPA-funded contract in 1996 to develop electronic switches enabled scientists at leading universities to research a new transistor design known as FinFET. This led to further DARPA and industry research from 2000-2006 and eventually to commercialization of the technology in 2011 to shrink transistor features sizes from 32 to 22 nanometers. Without this breakthrough, industry innovation would have stalled, and the world would be without the new and innovative commercial products enabled by advanced semiconductors.

- Wide Band Gap semiconductor materials development by DoD (initially ONR and then DARPA through the WBGS-RF program in the early 2000s) helped to rapidly advance an unproven material technology, gallium nitride (GaN), into an industrially relevant one that is now a part of all major RF semiconductor device manufacturers' portfolios and is an emerging market where the U.S. semiconductor industry is dominant. GaN is also in high-power-management semiconductors, and it makes blue-green lasers and LEDs possible. Without it much of today's high-end electronics such as LED TVs would not exist.

- Gallium arsenide (GaAs) transistor innovation by DoD (OSD and DARPA) through the Microwave and Millimeter Wave Integrated Circuit (MIMIC) program in the late 1980s, provided a key piece to the commercial sector as it sought to establish newly developed cellular phone technology in the 1990s. GaAs transistors enabled handheld phones to establish the critical communications link to cell towers, and to this day most smartphones contain a small piece of GaAs to perform this critical function. This program helped propel the U.S. semiconductor industry to become the dominant driver of the wireless revolution.

The U.S. now faces new technological challenges In the race for the "must win" technologies of the future (e.g., AI, quantum computing, and 5G), and Increased federal Investments In semiconductor research are needed to generate the next generation of Innovations to advance U.S. semiconductor leadership In the future.

Congress should substantially increase federal semiconductor R&D funding.

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