

INVEST & INNOVATE

U.S. SEMICONDUCTOR LEADERSHIP UNDER THE BIDEN-HARRIS ADMINISTRATION

January 2021

TABLE OF CONTENTS

- 1** Letter from President & CEO John Neuffer
- 2** SIA Policy Recommendations for the Biden-Harris Administration
- 3** The U.S. Share of Global Chip Manufacturing
- 4** Domestic Manufacturing Policy
- 5** Trade Policy
- 6** China Policy
- 7** Export Control Policy
- 8** Tax Policy
- 9** Environmental Policy
- 10** Research Policy
- 11** Workforce/Immigration Policy
- 12** Building America's Innovation Economy
- 13** U.S. Semiconductor Leadership: A Policy Blueprint

About SIA: For over 40 years, SIA has represented the semiconductor industry, one of America's top export sectors and a key driver of our country's economic strength, national security, and global technology leadership. SIA represents 98% of the U.S. semiconductor industry by revenue, and nearly two-thirds of non-U.S. firms. Learn more at www.semiconductors.org.



Dear President Biden and Vice President Harris,

Congratulations on your historic election, which comes at a time of abundant challenges and opportunities for our country and the world. As you know, a hallmark of America's strength and global leadership is its unparalleled commitment to innovation. Semiconductors, the chips at the heart of modern technologies, are foundational to America's economy, workforce, national security, and global innovation leadership.

Semiconductors were invented in America more than 60 years ago, and U.S. chip companies continue to lead the world in researching, designing, and producing the world's most advanced chips. America's global leadership in chip technology, however, is under greater threat than it has been in decades. The share of global chip manufacturing capacity in the U.S., for example, has shrunk from 37% to 12% over the last 30 years, mostly due to aggressive government incentives offered by overseas competitors. Three-quarters of the world's chip manufacturing capacity is now concentrated in East Asia, with China projected to command the largest share of production by 2030, due to its government's massive investments in this sector.

The dramatic decline in the U.S. share of global chip manufacturing coupled with insufficient federal investments in semiconductor R&D undermine our country's long-term ability to produce the advanced chips needed to support our economic recovery, power our military and critical infrastructure, create new high-paying jobs, reduce costs for clean energy technologies, and drive innovations in the must-win technologies of tomorrow. For our country to succeed in the future, we must continue to lead the world in semiconductor technology.

Bipartisan legislation was introduced in 2020 – and included in the recently enacted National Defense Authorization Act (NDAA) – that authorizes investments in domestic chip manufacturing incentives and research initiatives. It's critical these provisions get fully funded.

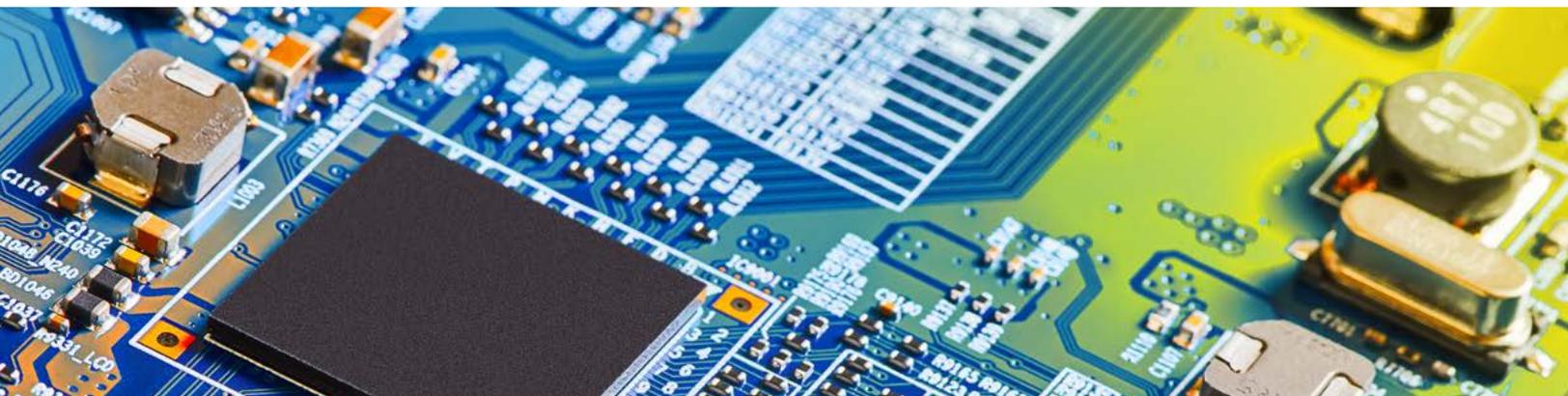
With bold action to address these defining challenges, your Administration can usher in a historic resurgence of chip manufacturing in America, strengthen our country's most critical industry, and help ensure the U.S. leads in crucial, chip-enabled technologies – artificial intelligence, quantum computing, 5G/6G communications, and countless others. This resurgence will define and determine America's strength for decades to come. We urge you to make it an important part of Build Back Better.

The various policy priorities outlined in this document will help the U.S. semiconductor industry continue to grow and innovate, which will keep America at its competitive best. We look forward to working with you in the years ahead to rise to the great challenges of our time, strengthen U.S. semiconductor leadership, and keep our country at the leading edge of innovation.

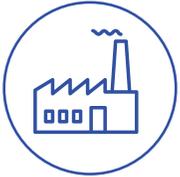


A handwritten signature in black ink, appearing to read 'John Neuffer', followed by a long horizontal line extending to the right.

John Neuffer
President & CEO, Semiconductor Industry Association



SIA POLICY RECOMMENDATIONS FOR THE BIDEN-HARRIS ADMINISTRATION



DOMESTIC MANUFACTURING

Incentivize U.S. semiconductor manufacturing and strengthen supply chains



TRADE

Re-establish U.S. trade leadership and governance globally



RESEARCH

Invest in American semiconductor technology leadership



IMMIGRATION/ WORKFORCE

Develop and attract a high-skilled workforce



EXPORT CONTROLS

Ensure export controls are narrow, targeted, and multilateral



TAX

Strengthen tax policy to promote global competitiveness



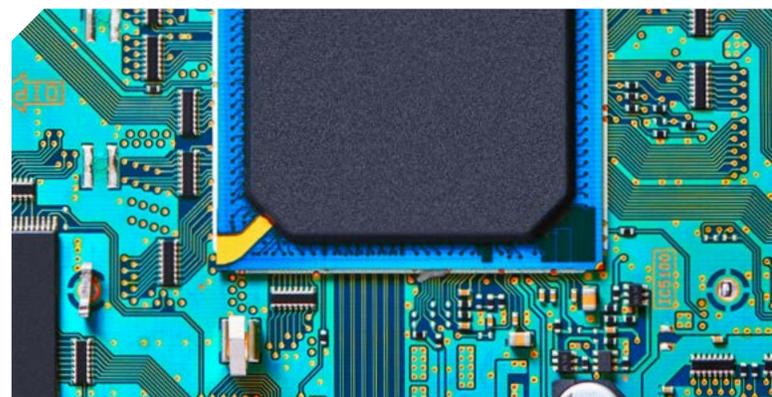
CHINA

Implement smart strategies for competing with China



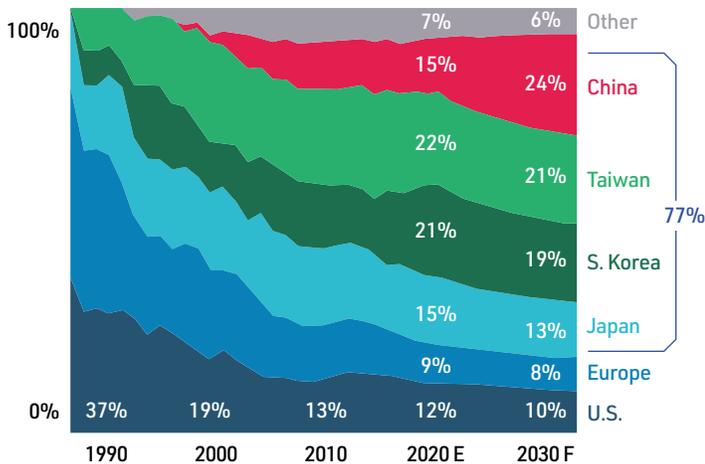
ENVIRONMENT

Adopt environmental regulations that promote innovation



THE U.S. SHARE OF GLOBAL CHIP MANUFACTURING HAS DECREASED DUE TO LACK OF GOVERNMENT INCENTIVES

U.S. manufacturing share has declined, while Asia's share has risen



THIS CHANGE IS DUE TO THE INCENTIVES GAP

The cost to build and operate a fab in the U.S. is **25-50%** more expensive than alternative locations abroad.

Government incentives directly account for **40-70%** of the U.S. cost disadvantage.

FEDERAL INCENTIVES ARE NEEDED TO TURN THE TIDE

Growth in global semiconductor demand is projected to require a 56% increase in manufacturing over the next 10 years. To attract the private investment for this growth to occur in the U.S., the cost differential attributable to government incentives abroad must be reduced. Without federal incentives, U.S. fab capacity will continue to decline; a robust program of incentives would stimulate private investment and enable the U.S. to capture a significant share of new fab construction.

Potential impact of new government incentives on U.S. manufacturing position

	Status quo- no federal incentives	\$20B incentive program	\$50B incentive program
Share of new addressable capacity captured by the U.S. (excl.- China)	12%	24%	41%
Total number of new fabs built in the U.S.	9	14	19
Total industry capital spending generated	\$69B	\$174B	\$279B

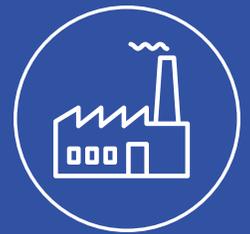
INCENTIVES TO PROMOTE SEMICONDUCTOR MANUFACTURING IN THE U.S. ARE CRITICAL TO U.S. NATIONAL SECURITY AND THE ECONOMY

National Security: provide domestic capabilities in chip fabrication to satisfy America's national security needs and improve the resiliency of our supply chains by re-balancing the military's current reliance on offshore production.

Economic Security and Growth: reverse the decline in U.S. semiconductor manufacturing and strengthen the U.S. industrial base.

Jobs: create up to 70,000 high-paying jobs in the U.S., ranging from highly educated engineers to fab technicians and operators to material suppliers.

DOMESTIC MANUFACTURING POLICY



Incentivize U.S. semiconductor manufacturing and strengthen supply chains as part of the “Build Back Better” plan

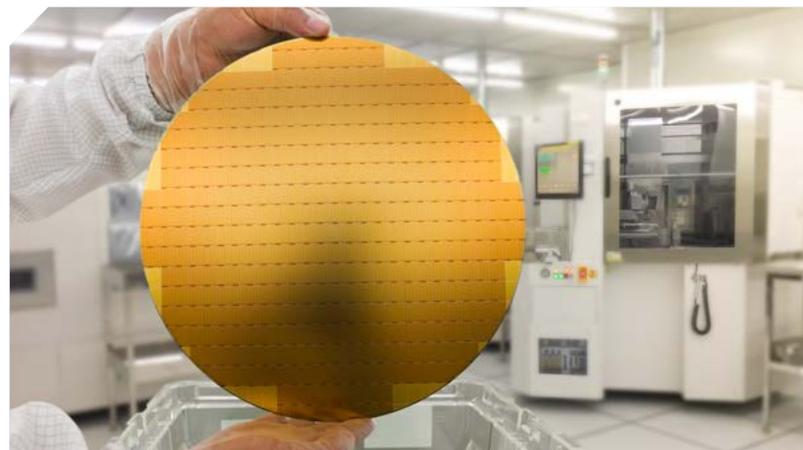
CONTEXT

Revitalizing semiconductor manufacturing in the U.S. as part of the “Build Back Better” plan has the potential to restore American leadership in advanced manufacturing, secure vital supply chains, grow well-paying jobs, tackle the climate crisis, contribute to our national security, and ensure long-term technological and economic competitiveness by driving innovation across many different sectors for decades to come. For example, semiconductors enable advancements in artificial intelligence, quantum computing, clean energy, medical technologies, and 5G. For context, the U.S. has a stable semiconductor manufacturing footprint with major commercial fabs in 18 states. However, America has lost out on many new and advanced semiconductor projects over the past three decades, largely due to generous subsidies and investments offered by governments in other regions. In 2020, the U.S. accounted for only 12% of global semiconductor manufacturing capacity, down from 37% in 1990. The cost to build and operate a fab in the U.S. is 25-50% more expensive than alternative locations abroad and government incentives directly account for 40-70% of the U.S. cost disadvantage. If the current trend continues, 83% of global fab capacity is projected to be located in Asia by 2030, with China accounting for the greatest growth. Global supply chains are – and will continue to be – critical to the semiconductor industry’s success. However, there is an economic and national security imperative to strike the right balance between dependence on global supply chains and maintaining robust production in the U.S.

RECOMMENDATIONS

- **Establish a federal grant program for incentivizing new domestic semiconductor manufacturing facilities:** Fully fund the incentives for semiconductor manufacturing as provided for in the 2021 NDAA. A significant investment in incentives is needed to make the U.S. the top location for fabs.

A recent [report](#) by the Boston Consulting Group found that a \$20 billion incentive program would result in the U.S. being the home to the second most fabs (excluding China) over the next ten years, while a \$50 billion program would put the U.S. in first place (again, excluding China).
- **Establish tax incentives to promote semiconductor manufacturing:** Adopt an investment tax credit for placing into service new semiconductor manufacturing equipment, as well as fab infrastructure and capital costs. Bipartisan legislation has been introduced in the 116th Congress to achieve this goal.
- **Dedicate federal support for the production of secure microelectronics to meet U.S. national security requirements:** As set forth in the 2021 NDAA, the Department of Defense should incentivize the establishment of capabilities to develop and produce secure semiconductors to meet national defense and critical infrastructure needs.



TRADE POLICY

Re-establish U.S. trade leadership & governance globally



CONTEXT

As a major exporting powerhouse, the U.S. semiconductor industry relies heavily on international trade. More than 80% of U.S. semiconductor industry revenue comes from sales to customers outside the United States, making semiconductors America's fifth-largest export. Access to global markets through trade agreements has enabled U.S.-based companies to secure 47% of the \$412 billion global semiconductor market in 2019. However, global trade rules need updating. U.S.-China trade tensions underscore the importance of establishing more robust global trade disciplines that protect and strengthen the semiconductor industry in the U.S. The U.S. should reassert a leadership role in trade policy and governance globally, with a focus on addressing discriminatory and market-distorting practices that are inadequately addressed by existing trade rules, including cybersecurity barriers, market-distorting subsidies, forced technology transfer and IP theft, and barriers to digital trade.

RECOMMENDATIONS

- **Strengthen the World Trade Organization (WTO):** Work with allies to update WTO rules to address the challenges of modern trade, including discriminatory cyber policies, market-distorting subsidies, and an open digital trade environment.
- **Pursue multilateral trade agreements to create new markets for U.S.-made semiconductors:** Pursue an ambitious trade policy agenda that opens markets for U.S. chipmakers, including rejoining the Trans-Pacific Partnership (CPTPP). U.S. withdrawal from the CPTPP marked a significant missed opportunity for U.S. semiconductor industry growth, as CPTPP countries account for 41% of total U.S. semiconductor exports. With the China-driven Regional Comprehensive Economic Partnership (RCEP) signed in November 2020, joining CPTPP would provide an opportunity to redefine trade and economic engagement in the Asia-Pacific.
- **Further Expand the Information Technology Agreement (ITA):** Signed in 1996 and updated in 2015, this plurilateral tariff elimination pact has increased U.S. exports of American-made technology products by 57 percent (ITC Report, 2016). Eliminating tariffs on new and innovative tech products under the ITA would increase affordability and accessibility of products critical to tackling key global challenges like climate change, the digital divide, and COVID-19.
- **Leverage existing institutions to assert U.S. leadership on semiconductor trade:** The World Semiconductor Council (WSC) and Government and Authorities Meeting on Semiconductors (GAMS) bring together industry and governments from China, Chinese Taipei, EU, Japan, Korea and the United States to focus specifically on semiconductor policy issues. The new administration should leverage this and other existing networks to advance its global technology trade agenda.



CHINA POLICY

Implement smart strategies for competing with China



CONTEXT

China is both a competitor and a top customer for the U.S. semiconductor industry. Its industrial policy and technology practices pose serious challenges to the U.S. economy and national security. China's 14th Five Year Plan explicitly outlines the goal of achieving "complete self-sufficiency" in semiconductors, backed by billions in state investment and discriminatory industrial policies. The United States must work with its allies to take a strong position against China's market-distorting policies, coordinate security policies, and curb illicit behavior such as IP theft. Proposals to completely "decouple" the two economies and technology supply chains would inflict significant harm on the semiconductor industry in the United States, our workforce, and the U.S. economy. According to a [report](#) from the Boston Consulting Group, prohibiting sales to China could erase 37% (\$83 Billion) of U.S. semiconductor industry revenue, overturning our long-standing global leadership position with an 18-percentage point drop in global market share. The U.S. must meet the "China Challenge" through smart, multilateral, and tailored policies that help us compete even more strongly on the global stage. Incentivizing manufacturing of advanced semiconductors in the U.S. should be a key pillar of any such strategy.

RECOMMENDATIONS

- **Build at home:** Establish a federal grant program and tax credit to incentivize domestic semiconductor manufacturing. Concurrently, increase federal investments in basic and applied research and development as well as ensure access to high-skilled talent to ensure U.S. long-term leadership in semiconductors.
- **Work with allies to pursue multilateral trade, security, and economic efforts to set new rules and principles to address Chinese state-capitalism and problematic digital policies:** Work with allies to develop new, and update existing, multilateral rules in important areas for the digital economy, including industrial subsidies, data policy, and supply chain security.
- **Pursue a results-based bilateral trade and economic relationship with China:** Seek to leverage the Phase One Trade Agreement between the U.S. and China to pursue greater changes to China's market access and industrial policies. Establish a focused, high-level bilateral mechanism on tech issues with clear priorities and a timetable for action on unresolved issues, such as China's market-distorting industrial subsidies, IP theft, and discriminatory cyber and other digital policies. Avoid ineffective policies, like tariffs, that harm U.S. consumers.



EXPORT CONTROL POLICY

Ensure export controls are narrow, multilateral, and targeted



CONTEXT

Access to global markets is critical to the success of the U.S. semiconductor industry, as more than 80% of sales are derived from overseas markets. Revenue from global semiconductor sales is reinvested into R&D needed to maintain our technology leadership. The U.S. government has traditionally respected the need to maintain access to global markets for commercial products by focusing export controls on technologies directly linked to national security and foreign policy goals and by acting in concert with our allies. In recent years, however, export controls have been used more expansively to restrict a broad range of non-sensitive commercial products, with the U.S. acting unilaterally to achieve broader trade policy or other goals. These actions risk U.S. semiconductor leadership – itself a contributor to national security – and provide a competitive advantage to global competitors.

RECOMMENDATIONS

- **Narrowly target controls to advance specific national security goals:** Export controls should be narrowly targeted at technologies critical to achieving national security and foreign policy objectives, and not cover widely available commercial products or used as a tool of a broader industrial or trade policy.
- **Consider impacts of controls on U.S. industry:** The government should consider the impact new controls have on the semiconductor industry in the U.S., its ability to continue investing high levels in research needed to maintain technology leadership, and its competitive position, given the foreign availability of similar technologies. Avoid creating incentives for the development of new technologies outside the U.S., and work with industry to modernize outdated controls.
- **Coordinate with allies:** Controls are ineffective if technologies are available from non-U.S. sources. Work with allies to strengthen existing multilateral institutions, and where necessary, explore alternative plurilateral approaches to ensure export controls are effective, applied for the purposes of national security, and avoid unilateral loss for American industry.
- **Improve the process:** The export control process should return to regular order, with the issuance of proposed rules, an opportunity for comment by industry and other stakeholders, and government taking into account this input. Industry should be given sufficient time to implement any new controls, additions to the Entity List, or other actions.



TAX POLICY

Strengthen tax policy to promote global competitiveness

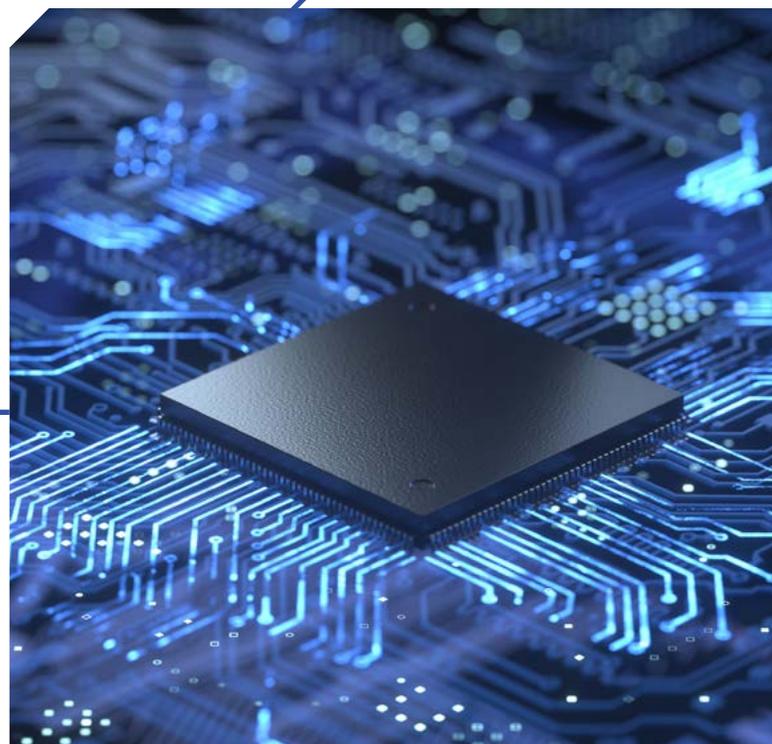


CONTEXT

The semiconductor industry is capital-intensive (\$31.9 billion in 2019) and research-intensive (\$39.8 billion in 2019), and smart tax policy is essential to ensuring the competitiveness of the U.S. semiconductor industry. Other locations, including China and Europe, provide generous tax incentives and other subsidies to attract new semiconductor manufacturing, with no commensurate federal incentives in the U.S. As a result, it costs 25-50% more to build and operate a fab in the U.S. compared with overseas. The U.S. share of semiconductor manufacturing capacity has dropped from 37% in 1990 to 12% in 2020. Similarly, U.S. incentives for research lag behind our global competitors. The R&D credit in the U.S. ranks 24th out of 34 key countries. For example, China's R&D tax subsidy is 2.7 times more generous than the U.S. credit. The 2017 Tax Cuts and Jobs Act (TCJA) further eroded the value of the R&D tax credit by requiring businesses to amortize R&D expenses over a period of years starting in 2022, rather than deducting qualified R&D expenses in the same year in which they are incurred.

RECOMMENDATIONS

- **Incentivize manufacturing in the U.S. with an investment tax credit (ITC):** As provided for in bipartisan legislation introduced in the 116th Congress (HR 7178; S. 3933), enact an ITC to encourage investments in the U.S. in semiconductor manufacturing equipment, fab infrastructure, and capital costs.
- **Strengthen the R&D credit:** To ensure continued U.S. technology leadership, strengthen the existing credit to make it comparable with research incentives offered in other countries.
- **Repeal the R&D amortization:** If this takes effect, the U.S. will be the only developed country with such a policy, making it a less attractive place for critical R&D. Repealing the R&D amortization provision would greatly stimulate domestic semiconductor research. Bipartisan legislation introduced in the 116th Congress (HR 4549) achieves this goal.



ENVIRONMENTAL POLICY

Adopt environmental policies that enable industry's ability to innovate



CONTEXT

Semiconductors enable technologies critical to our clean energy future and efficiency gains necessary to reducing emissions throughout the economy. This is because semiconductors make other products and services “smarter,” improve their efficiency, and assist in the generation and distribution of clean energy. This positive impact reverberates throughout major sectors of the economy and our society – ranging from transportation and manufacturing to energy and agriculture – dramatically reducing emissions and helping achieve our climate goals. Studies indicate that semiconductor-enabled technologies can help achieve a substantial amount of the emissions reductions needed to stem the worst impacts of climate change. Semiconductor manufacturing is a highly complex process requiring the use of chemicals and gases with specific functional attributes, operating in conjunction with sophisticated capital equipment, to manufacture at the nanoscale. In many cases, these chemicals and gases may pose environmental or health concerns, but typically there are no feasible substitutes. The industry employs extensive and often redundant controls to manage these chemicals to reduce environmental releases and minimize human exposures. The industry has successfully phased out certain chemicals of concern and has taken measures to minimize emissions of greenhouse gases (the industry accounts for 0.2% of industrial emissions in the U.S.).

RECOMMENDATIONS

- **Adopt regulations that continue the industry's ability to innovate:** Regulations governing key chemicals used in semiconductor manufacturing should be designed to provide critical-use exemptions for chemicals essential to the fabrication process where feasible alternatives are unavailable. Such regulations should also consider the conditions of use in fabs – characterized by extensive and often redundant controls to minimize releases to the environment and employees – and avoid improperly categorizing and regulating semiconductor uses along with other industrial uses.
- **Credit past GHG reduction efforts:** Climate policies should credit the actions of the semiconductor industry to date to reduce greenhouse gas emissions (GHG) and provide for flexible, market-based implementation.
- **Promote technologies enabled by semiconductors to address climate change:** Technologies enabled by semiconductors – such as smart grid, wind turbines, and solar-energy systems – play a major role in improving energy efficiency and reducing emissions throughout the economy, thereby making a significant positive contribution toward our climate goals. Procurement and other policies in a range of areas throughout the economy should leverage technology solutions enabled by semiconductors.



RESEARCH POLICY

Invest in American semiconductor technology leadership



CONTEXT

Given the critical enabling role of semiconductors in advancing innovations in technologies of the future – such as AI, quantum computing, clean energy, and 5G/6G – continued U.S. semiconductor leadership is essential for the U.S. to lead the world in these technologies. As a result, public and private investments in semiconductor research is critical to our economy, technology leadership, and national security. The U.S. semiconductor industry is doing its part: the industry invests approximately one-fifth of its annual revenue into R&D, a higher share than almost any other industry, amounting to nearly \$40 billion in 2019. In contrast, federal investments in R&D have failed to keep pace with the rising costs of developing new technology, while global competitors, including China, are investing heavily to challenge U.S. leadership. According to the Information Technology and Innovation Foundation, the Chinese government has increased its R&D funding by 330% from \$23 billion to \$98 billion, while U.S. government R&D grew by just 2% from \$121 billion to \$124 billion from 2003-2017. Without significant U.S. investments in federal science and technology programs, China will surpass the U.S. in federal R&D spending in a few years.

RECOMMENDATIONS

- **Triple federal funding for semiconductor R&D from 2021-2026:** To maintain U.S. technology preeminence, Congress and the administration should triple federal funding for semiconductor research and double investments in semiconductor-related fields, such as electrical engineering, mathematics, materials and computer science. The SIA/ SRC [Decadal Plan](#) for Semiconductors provides a roadmap for research priorities. These investments in both basic and applied research will help maintain U.S. technology leadership – and the economic and national security benefits resulting from such leadership – and provide the added benefit of training the skilled workforce of scientists and engineers needed to compete in the global marketplace.
- **Establish and fully fund a public-private National Semiconductor Technology Center (NSTC):** As authorized in the FY2021 NDAA, commit funding to a public-private research hub with advanced semiconductor tooling focused on advanced development and prototyping. The NSTC would help commercialize semiconductor innovations and help the U.S. compete with countries with similar centers, and keep U.S. semiconductor manufacturing, design, and tooling in the lead.



WORKFORCE/IMMIGRATION POLICY



Develop a high-skilled workforce

CONTEXT

The semiconductor industry relies on a highly skilled workforce of scientists, engineers, and other professionals in a range of technical fields. There are currently several thousand open technical positions in the U.S. semiconductor industry, with many of these positions having been open for months or longer. Companies experience challenges finding enough qualified U.S. workers with the advanced graduate level education, skills, and expertise needed to compete in this global economy. Wages in the semiconductor industry have grown 4.4% per year on average since 2001 – significantly faster than wage growth in other engineering occupations and in the U.S. economy as a whole. In 2011, 87% of semiconductor patents awarded to top U.S. universities had at least one foreign-born inventor. Between 2000 and 2010, the United States enjoyed a net influx of about 100,000 electrical engineering patent holders. Current U.S. high-skilled immigration policy discourages the retention of students in electrical engineering and computer science, fields in which foreign nationals make up nearly 80% of current graduate students at U.S. universities.

RECOMMENDATIONS

- **Invest in STEM education at all levels:** Act to align education curricula and policy with U.S. workforce needs, including by incorporating more direct, hands-on work experience into educational experiences. The U.S. education system is poorly aligned with the needs of high-technology industries that drive the U.S. economy, including the semiconductor industry, with too few American students, especially women and underrepresented minorities, developing needed STEM skills.
- **Recruit and retain semiconductor talent:** Act swiftly to enact high-skilled immigration reforms that eliminate the existing green card backlog, by ending discriminatory per-country green card caps and exempting advanced STEM degree graduates of U.S. universities from existing green card caps.



BUILDING AMERICA'S INNOVATION ECONOMY

Maintaining a vibrant U.S. semiconductor industry is critical to America's continued strength



SEMICONDUCTORS ARE THE BRAINS OF MODERN ELECTRONICS, enabling advances in medical devices and health care, communications, computing, defense, transportation, clean energy, and technologies of the future such as artificial intelligence, quantum computing, and advanced wireless networks.



SEMICONDUCTORS ARE A TOP-5 U.S. EXPORT, and more than 80% of U.S. semiconductor companies' sales are to overseas customers. The United States exported **\$46 billion in semiconductors** in 2019 and maintains a consistent trade surplus in semiconductors, including with major trading partners such as China.



THE U.S. SEMICONDUCTOR INDUSTRY IS THE WORLDWIDE INDUSTRY LEADER with about half of global market share and sales of **\$193 billion** in 2019.



THE U.S. SEMICONDUCTOR INDUSTRY ANNUALLY INVESTS ABOUT ONE-FIFTH OF ITS REVENUE INTO R&D (\$40 billion in 2019), which is the second-highest share of any major U.S. industry, behind only the pharmaceutical industry.



THE SEMICONDUCTOR INDUSTRY DIRECTLY EMPLOYS NEARLY A QUARTER OF A MILLION PEOPLE IN THE U.S. and supports more than one million additional U.S. jobs.



RAPID INNOVATION HAS ENABLED THE SEMICONDUCTOR INDUSTRY TO PRODUCE EXPONENTIALLY MORE ADVANCED PRODUCTS AT A LOWER COST, a principle known as Moore's Law. A single smartphone today has far more computing power than the computers used by NASA to land a person on the moon in 1969.



NEARLY HALF OF U.S. SEMICONDUCTOR MANUFACTURERS' PRODUCTION IS DONE IN THE UNITED STATES, and 18 states are home to major semiconductor manufacturing facilities.



THE U.S. SEMICONDUCTOR INDUSTRY IS AMERICA'S #1 CONTRIBUTOR TO LABOR PRODUCTIVITY GROWTH. Semiconductor technology has made virtually all sectors of the U.S. economy – from farming to manufacturing – more effective and efficient.



ECONOMIC STRENGTH



NATIONAL SECURITY



TECHNOLOGY LEADERSHIP

U.S. SEMICONDUCTOR LEADERSHIP: A POLICY BLUEPRINT

PROTECT

NARROW & TARGETED TECHNOLOGY
EXPORT CONTROLS

FOCUSED NATIONAL SECURITY & FOREIGN
POLICY-BASED END-USER CONTROLS

CYBERSECURITY &
INTELLECTUAL PROPERTY

MULTILATERAL COOPERATION

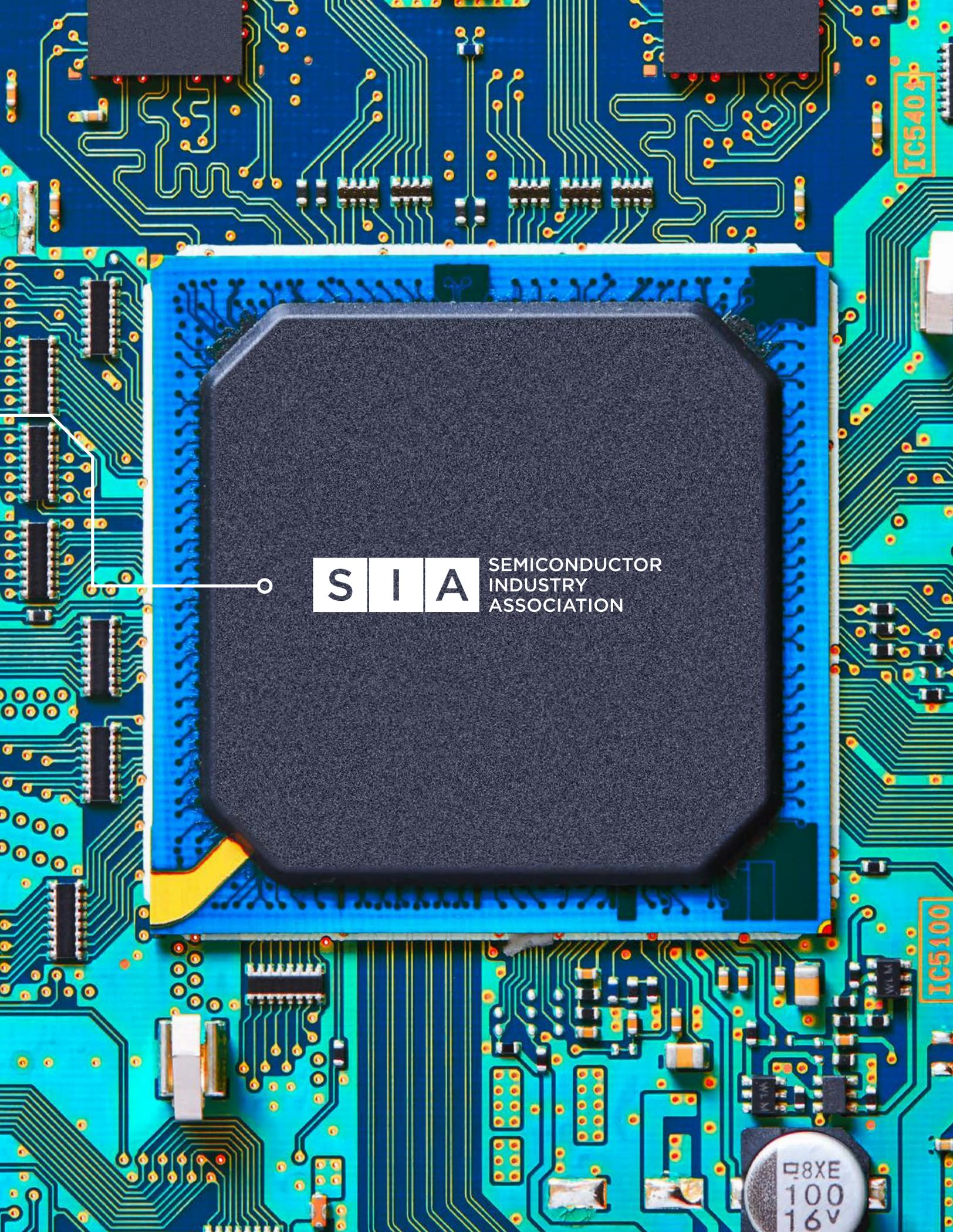
PROMOTE

MANUFACTURING INCENTIVES

BASIC & APPLIED
RESEARCH INVESTMENTS

STEM EDUCATION & IMMIGRATION

TRADE PROMOTION



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SEMICONDUCTOR
INDUSTRY
ASSOCIATION

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