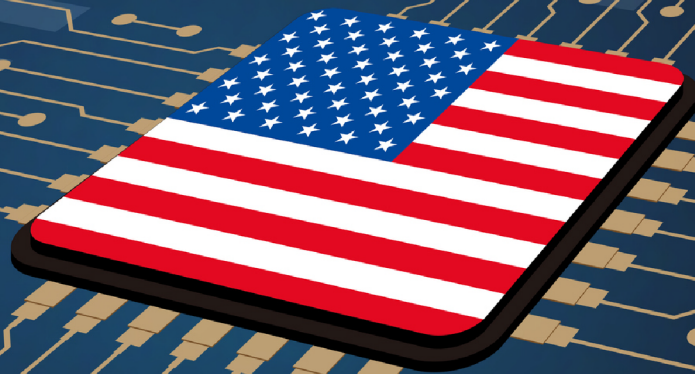


CHIPS *for* AMERICA



Building the U.S. Semiconductor Workforce

Progress Report

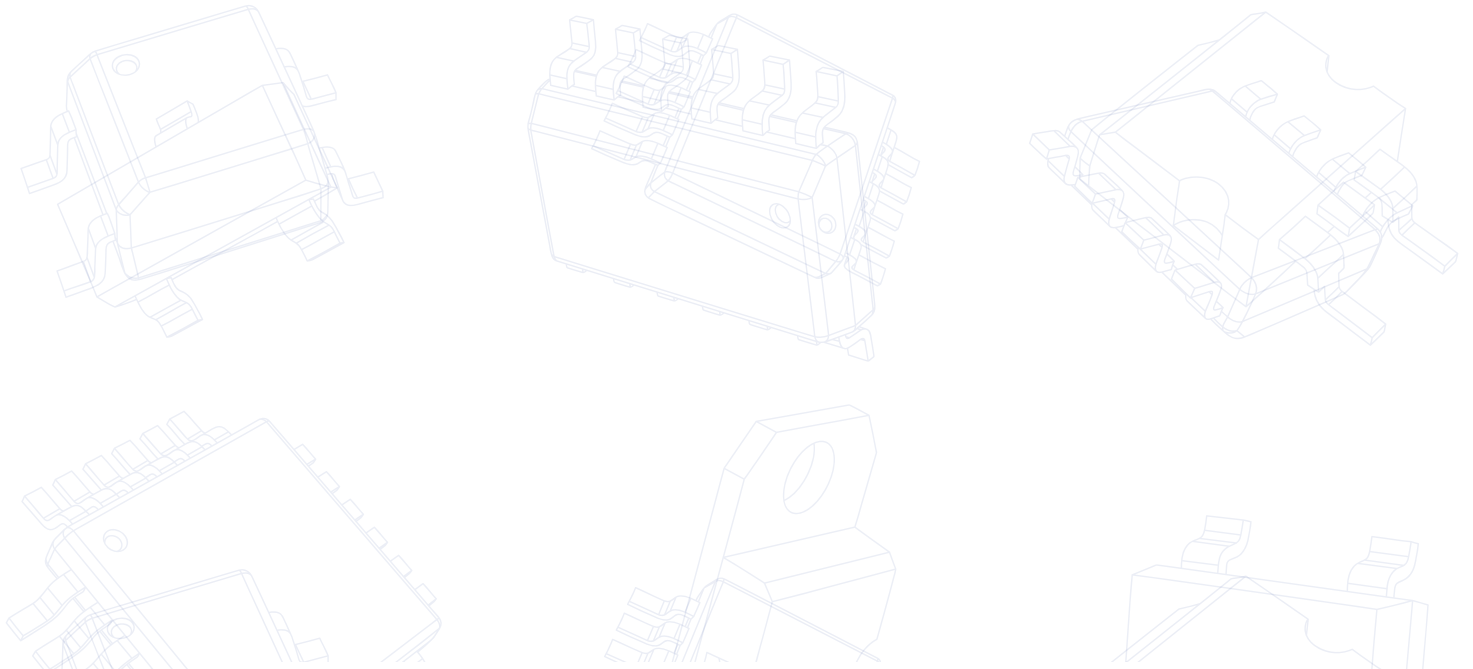
CHIPS for America

November 3, 2023



CHIPS
for AMERICA

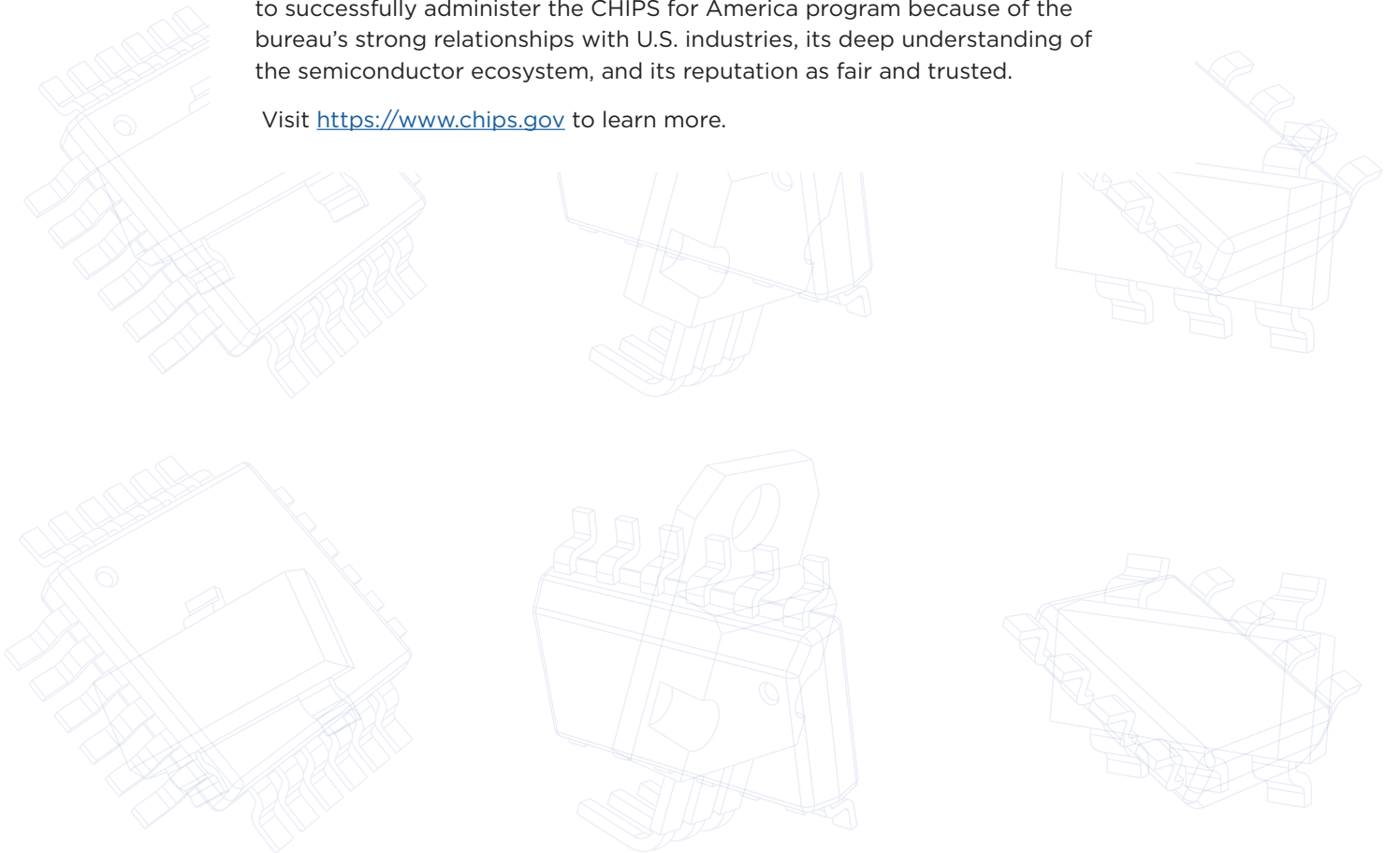
NIST | NATIONAL INSTITUTE OF
STANDARDS AND TECHNOLOGY
U.S. DEPARTMENT OF COMMERCE



CHIPS for America includes the CHIPS Program Office, responsible for semiconductor incentives, and the CHIPS Research and Development Office, responsible for R&D programs. Both sit within the National Institute of Standards and Technology (NIST) at the Department of Commerce.

NIST promotes U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life. NIST is uniquely positioned to successfully administer the CHIPS for America program because of the bureau's strong relationships with U.S. industries, its deep understanding of the semiconductor ecosystem, and its reputation as fair and trusted.

Visit <https://www.chips.gov> to learn more.





INVESTING IN AMERICA'S WORKERS

When President Joseph R. Biden, Jr. signed the bipartisan CHIPS and Science Act in August 2022, he committed the United States to regaining and accelerating U.S. leadership in the semiconductor industry. In response, the private sector announced hundreds of billions of dollars to develop domestic manufacturing and research capacity, bringing semiconductor industry commitments to more than \$231 billion since the President took office. As a key part of President Biden's Investing in America agenda, this unprecedented investment in one of the world's most critical technologies will advance our economic and national security and create new opportunities for communities across the country. This historic combination of federal, private, and local investment will also, consistent with President Biden's vision, create for workers and families good-paying, high-quality jobs, including union jobs and jobs that don't require a four-year degree, with hundreds of thousands of new opportunities for American technicians, manufacturers, construction workers, scientists, engineers, and entrepreneurs.

To achieve the CHIPS and Science Act's objectives to increase domestic semiconductor manufacturing capacity and advance U.S. leadership in semiconductor research and development (R&D), we must empower American workers. Recognizing this, Congress and the Biden-Harris Administration have prioritized making sure America is ready to meet the challenge. Congress directed multiple agencies to invest in American workers, required CHIPS incentives recipients to develop workforce strategies with partners, and charged the Department of Commerce and others to integrate workforce development into new R&D efforts. In addition, the Biden-Harris Administration is partnering with local stakeholders across the country to harness the full potential of Investing in America, including through the creation of [Workforce Hubs](#), an Advanced Manufacturing Workforce Sprint, and other administration-wide programs. These activities will make the United States more competitive, enhance our technological leadership, create good-paying jobs, and protect national security.

GROWING THE U.S. WORKFORCE

The Department of Commerce has made growing and sustaining the semiconductor workforce a priority for both the \$39 billion CHIPS incentives program to jumpstart domestic semiconductor manufacturing and the \$11 billion CHIPS R&D program. Building on the Department's stakeholder engagement and research, Department of Commerce Secretary Gina Raimondo announced an ambitious whole-of-society call to action to build the world's most competitive, skilled, and diverse workforce over the next decade. In a [keynote speech](#) about the Administration's long-term vision for CHIPS for America, she called on:

- The United States to **double the semiconductor workforce** overall
- U.S. colleges and universities, including minority-serving institutions, to **triple the number of graduates in semiconductor-related fields**, including engineering
- Semiconductor companies to work with high schools, community colleges, and unions to **train 100,000 new technicians** through apprenticeships, career and technical education, and career pathway programs
- Colleges, universities, and training programs to expand recruitment and enable more people from underserved communities – including women and veterans – to **launch semiconductor industry careers**
- Construction companies, unions, semiconductor manufacturers, and government to work together to hire and train an additional **million women in construction** to meet the demand across a range of industries, including CHIPS projects

Accomplishing these goals will require close collaboration across government, industry, education, labor unions, and community organizations. CHIPS for America will leverage the manufacturing incentives' requirements to develop workforce strategies; incorporate workforce initiatives across its R&D efforts; and collaborate with federal, state, and local partners to develop and expand training initiatives. CHIPS for America will also continue its engagements with agencies such as the National Science Foundation, which is responsible for the \$200 million CHIPS for America Workforce Fund, to support talent creation across the semiconductor industry. Consistent with the Department's workforce development [best practices and principles](#), these initiatives will serve workers, scale up proven practices, broaden participation, and be employer-driven, community-guided, measurable, and sustainable.

The Department's combined manufacturing and research efforts across CHIPS for America will make strategic investments in education and training to help seed and grow the world-class labor force needed to advance chip research, design, manufacturing, packaging, innovation, and entrepreneurship.

THE ROLE OF CHIPS FOR AMERICA

Since Secretary Raimondo announced workforce calls to action in February, CHIPS for America has worked with the semiconductor community, education providers, labor unions, and other community partners to develop a strong vision for workforce development. Key strategies to date include:

- **Catalyzing Employer Investments in Workforce:** The manufacturing incentives program is crowding in private capital

for talent development by encouraging semiconductor employers to commit resources to workforce development. To supplement company resources, the Department expects most incentives awards will also include dedicated funds for workforce development. Based on public commitments and industry benchmarks, CHIPS for America anticipates total public and private investments in workforce for CHIPS-funded facilities will exceed \$500 million. Following awards, CHIPS for America will work with recipients and regional education and training partners to support the implementation of workforce investments, including Registered Apprenticeships, and hold companies accountable to workforce development targets. In March 2023, CHIPS for America released a detailed [Workforce Development Planning Guide](#) to support workforce strategies consistent with the Biden-Harris Administration's [Good Jobs Principles](#).

- **Encouraging High-Quality Jobs:** Good jobs are at the center of the CHIPS for America vision for a vibrant domestic semiconductor industry. CHIPS for America programs include intentional strategies to ensure federal investments support good-paying jobs and that workers can form and join unions and bargain collectively. For the CHIPS incentives program, the quality of the workforce development plan is one of six evaluation criteria informing the Department's holistic evaluation process. Applicants need to explain how they have engaged a broad range of workforce partners and how their projects will create quality employment opportunities that attract workers in a tight labor market. Following awards, the Department expects strong stakeholder engagement throughout

the program lifecycle to help ensure workers' voices are represented in the workplace.

- **Promoting State and Local Participation:** CHIPS for America has encouraged state and local governments to provide workforce investments as part of an application for CHIPS incentives funding. For example, the CHIPS funding opportunity for commercial fabrication facilities explicitly prioritizes state and local incentive packages that benefit a regional semiconductor ecosystem, including incentives for workforce and education. Funding opportunities for [smaller suppliers](#) further support state and local participation through consortia models. Suppliers are encouraged to develop workforce strategies in partnership with state and local government entities, educational institutions, unions, and other partners, and to apply together for incentives to support their regional cluster. Since the passage of the CHIPS and Science Act, at least seven states have dedicated new funding to support workforce training for the semiconductor job growth supported by the legislation.
- **Engaging Community Organizations, Labor Unions, Industry, and Academia:** CHIPS for America is committed to fostering partnerships among government, industry, labor unions, community organizations and other intermediaries, and educational institutions — including community colleges, high schools, and local workforce training organizations. To facilitate collaboration, the Department has hosted public webinars focused on workforce development and sectoral partnerships, engaged directly with education and training partners in over

25 states — including hosting in-person workforce roundtables and listening tour sessions — and launched a [Teaming Partner List](#) to help community stakeholders forge partnerships. The Department also tasked the Congressionally mandated Industrial Advisory Committee (IAC), which includes academic representatives, to recommend actions to meet the nation's workforce needs. Since President Biden signed the CHIPS and Science Act into law, more than 50 community colleges across 19 states have announced new or expanded programming to support semiconductor industry opportunities.

- **Leveraging Research and Development Investments for Workforce Needs:** The CHIPS and Science Act funded four related R&D efforts at the Department of Commerce: the National Semiconductor Technology Center (NSTC), National Advanced Packaging Manufacturing Program (NAPMP), up to three Manufacturing USA Institutes, and the CHIPS R&D Metrology Program. These programs will be essential to securing and extending America's innovation and technological leadership in the 21st century. CHIPS for America is integrating education and workforce development investment into each of these efforts, with a major focus on the NSTC, which is envisioned as a newly-formed, neutral public-private consortium. In April 2023, the [Vision and Strategy for the National Semiconductor Technology Center](#) named workforce development as one of the NSTC's three primary objectives, calling on the consortium to scale up proven workforce development programs and to develop novel training approaches. These actions could engage new regions and partners in workforce development as well as build on efforts funded by CHIPS

manufacturing incentives, propagating the most successful approaches nationwide.

- **Expanding the Workforce Pipeline:** CHIPS for America is working to attract and retain students and workers across America in the semiconductor industry, including women, veterans, people of color, individuals with disabilities, and people from rural communities. To increase awareness of opportunities, the Department has conducted targeted outreach to groups including national civil rights organizations, chambers of commerce and trade associations, minority lending institutions, and regional and national professional associations. CHIPS for America is also encouraging industry and community stakeholders to address some of the biggest barriers to workforce participation through supportive services — including transportation, housing, and child care. For instance, entities seeking \$150 million or more in manufacturing incentives must provide a plan for access to affordable, quality, reliable, and accessible child care for both their facilities and construction workforce.

UPCOMING WORKFORCE INITIATIVES AND EFFORTS

Online job postings data show semiconductor jobs are already growing in the United States as a result of the passage of the CHIPS and Science Act. To support access to these new opportunities and to other jobs over the next decade, the Department will continue to implement education and workforce development strategies that reflect changing labor needs across the country. The Department continues to engage and collect feedback from the semiconductor community as it stands

up additional workforce initiatives, including activities at the NSTC and partnerships with other state, local, and federal entities.

NATIONAL SEMICONDUCTOR TECHNOLOGY CENTER WORKFORCE CENTER OF EXCELLENCE PROPOSALS

As a flagship CHIPS for America initiative, the NSTC will provide a once-in-a-lifetime opportunity to build an anchor institution for the semiconductor industry, including to meet the needs of the current and future workforce. The Department has worked with the semiconductor community, consulted the [IAC](#), and collected [requests for information](#) to develop specific workforce development activities for potential inclusion in the NSTC. One key proposal under development includes the creation of one or more workforce centers of excellence. These centers of excellence could:

1. **Convene** industry, research, education, government, and labor stakeholders, enabling employers to work directly with education and training providers;
2. **Collect data** to measure the success of existing programs and guide future investment;
3. **Scale up** proven programs; and
4. **Pilot new efforts**, including initiatives to engage underserved communities.

Efforts under consideration to be led by one or more workforce centers of excellence include:

- **Aligning Semiconductor Education:** A voluntary, employer-informed workforce framework would help align educational credentials and experiences, including apprenticeships, with employer knowledge and skill requirements. A new center of excellence could ensure that workforce credentials map to clear career pathways and both anticipate and address the impact

of new technologies developed by the NSTC and NAPMP. The IAC recommended bringing together educational institutions, companies, trade associations, and other partners to develop an educational framework.

- **Increasing Awareness of Semiconductor Industry Opportunities:** CHIPS for America workforce initiatives can inspire a new generation of Americans to realize the potential and excitement of semiconductor-related fields. While student applications to full-time semiconductor industry jobs increased by 79% in the past year, stakeholder inputs to the Department indicate the continuing need to attract new students and workers. A national awareness campaign, led by a workforce center of excellence, could increase visibility of semiconductor industry careers and support the economic viability of new educational programs. The IAC recommended establishing an awareness campaign as well as a K-12 STEM advocacy effort.
- **Accelerating Access to Educational Resources:** In addition to funding the development and promulgation of educational curriculum, the NSTC could offer low-cost access to curated physical and digital educational infrastructure. A workforce center of excellence could offer a centralized digital repository of industry and worker resources such as educational materials, on-demand courses, information on training programs and micro-credentials, opportunities for experiential learning and employment, and work-based learning experiences. A center of excellence could also provide physical locations for training, provide equipment and faculty with industry experience, and develop new training methodologies that leverage technological advancements. The IAC

similarly recommended incentivizing trade associations and professional associations to make training programs more accessible, with a particular focus on advanced packaging.

BUILDING EDUCATION AND TRAINING CAPACITY

In addition to the NSTC workforce proposals, the Department will prioritize initiatives that grow the manufacturing workforce needed for CHIPS-financed projects, with a focus on developing productive, self-sustaining regional clusters. Concepts under development include:

- **Increasing the Impact of Existing Programs:** CHIPS for America will work closely with partners at the National Science Foundation and with other members of the Subcommittee for Microelectronics Leadership, such as the Departments of Defense, Energy, Education, and Labor, to increase access to training. Where consistent with the Department's mission and review processes, CHIPS for America will seek opportunities to help scale up existing programs to meet growing needs. The manufacturing incentives program will embed rigorous workforce data collection into its award terms to inform future investment priorities at Commerce and other agencies.
- **Increasing Educational Capacity and Student Opportunities:** Tripling the number of graduates in semiconductor-related fields will require new faculty and teaching staff as well as new and upgraded educational infrastructure. The CHIPS R&D Office will explore opportunities to fund these resources at colleges, universities, and other regional educational and training institutions. By increasing the availability of faculty, facilities, and equipment, milestone-

based funding could support training early career talent and reskilling incumbent workers in the semiconductor industry. The CHIPS R&D Office will also explore opportunities to fund student opportunities, including internships, fellowships, traineeships, and apprenticeships in priority research areas.

- **Building and Growing Regional Intermediaries:** CHIPS for America is prioritizing the development of strong regional workforce ecosystems that can meet the industry's workforce skill needs and expand access to the good-paying jobs that CHIPS investments will create. Empowering effective regional intermediaries that can coordinate across multiple community and educational partners is key to this strategy. CHIPS for America staff will work closely with incentives recipients to help ensure sufficient regional capacity is built out to support the ambitious needs for hiring expansion, especially for technicians. Manufacturing incentives opportunities also strongly encourage sectoral partnerships, which bring together multiple employers and partners in a region.

ADVANCING THE CONSTRUCTION WORKFORCE

Achieving the objectives of the CHIPS and Science Act requires training and inspiring a skilled and diverse U.S. construction workforce to build, expand, and maintain semiconductor facilities. The Department recognizes the critical role of a skilled construction workforce in development of the U.S. semiconductor ecosystem. CHIPS-funded facilities are required to pay prevailing wage rates, thus supporting good-paying jobs. Semiconductor companies

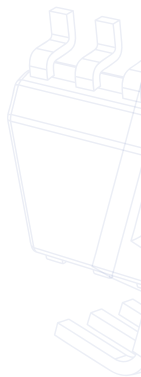
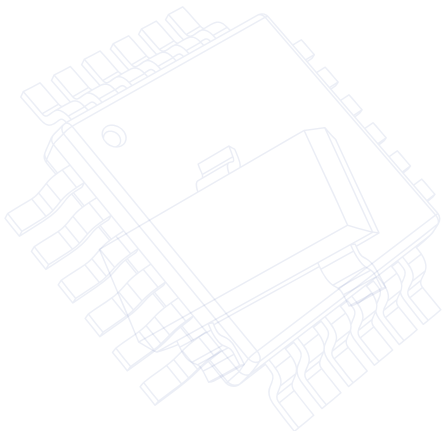
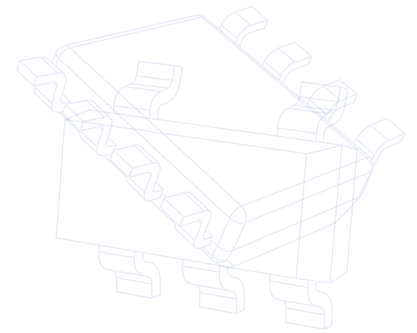
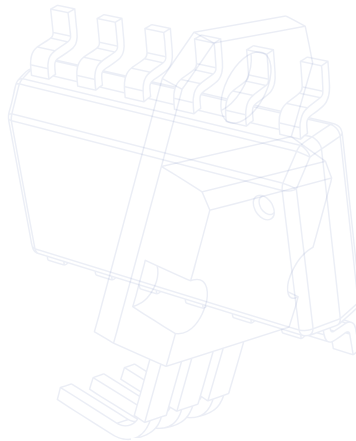
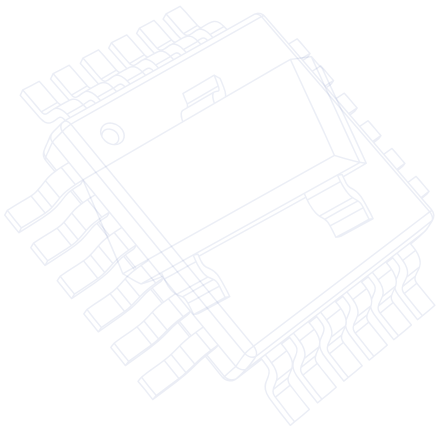
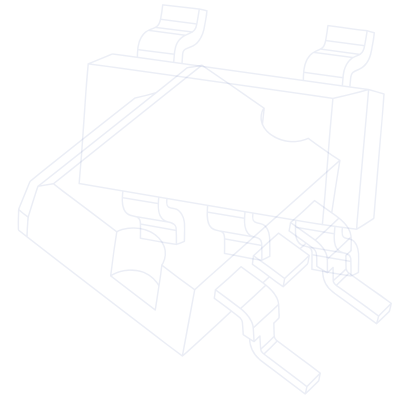
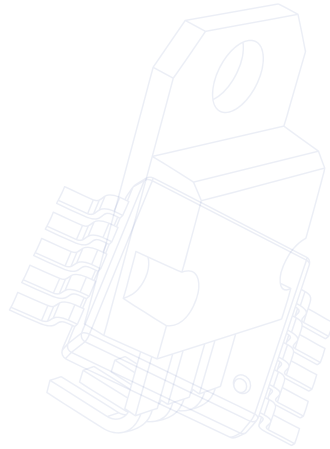
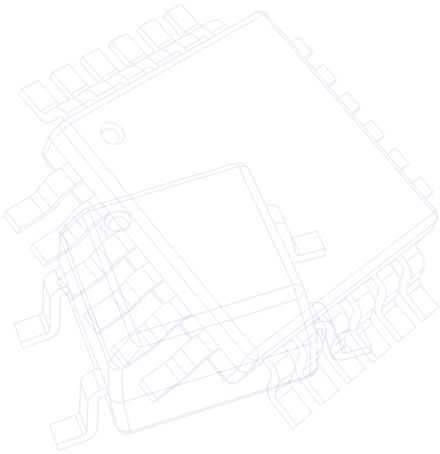
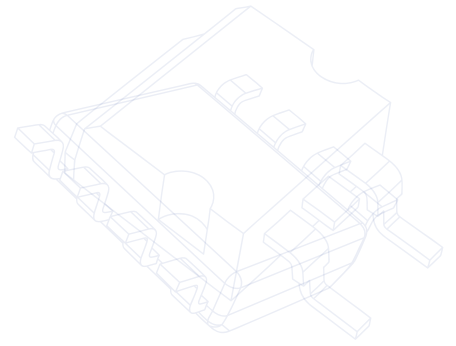
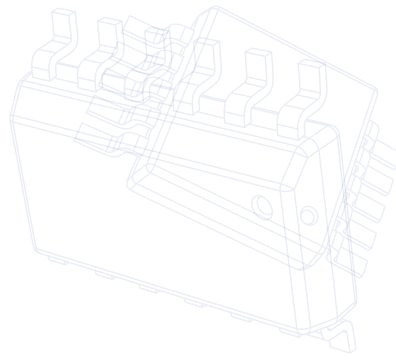
are partnering with labor unions to recruit, train and retain construction talent and ensure that job sites are safe for workers. The incentives program also strongly encourages the use of project labor agreements (PLAs) for CHIPS-funded construction projects to ensure that projects are completed with a steady supply of labor and without delays. Applicants that do not include a PLA must make clear commitments to ensure workforce continuity. Several semiconductor companies have already publicly committed to PLAs for construction of semiconductor facilities in the United States.

CHIPS for America is developing a construction workforce approach that leverages the manufacturing incentives program's workforce provisions and encourages investments to recruit, retain, and train American workers in good-paying, safe construction jobs. As a result of CHIPS investments, the Department expects new commitments to Registered Apprenticeships and pre-apprenticeship programs that will train American workers in specialized semiconductor construction and maintenance operations.

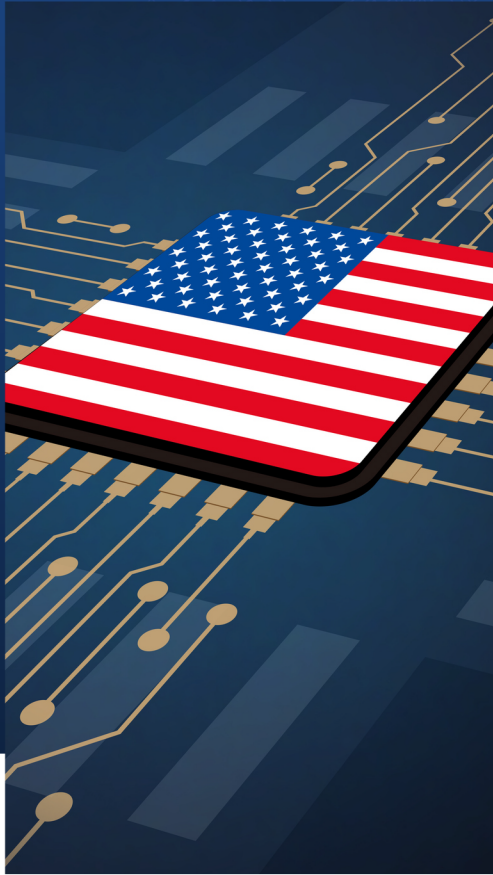
THE ROADMAP FORWARD

Fulfilling the promise of the CHIPS for America investments requires a whole-of-nation effort to build the world's best semiconductor workforce. The Department will continue to engage closely with stakeholders and partners including from academia and labor to build on existing momentum. Beginning in November 2023 and continuing through 2024, CHIPS for America will launch a new round of community forums to further refine its strategies and identify new opportunities for impact. As manufacturing incentives funds are awarded, the Department will actively support the implementation, monitoring, and evaluation of workforce initiatives to ensure learnings inform future

workforce development efforts. In addition, the CHIPS for America Teaming Partner List will serve as a continued resource to support new industry-community coalitions forming across the country. Visit www.chips.gov to learn more about the CHIPS for America programs. Sign up for our email list to be alerted to upcoming events, webinars, and to stay up to date on programs and funding opportunities.



Certain commercial entities, equipment, or materials may be identified in this document in order to describe an experimental procedure or concept adequately. Such identification does not imply recommendation or endorsement by the National Institute of Standards and Technology, the U.S. Department of Commerce, or any part of the United States Government, nor is it intended to imply that the entities, materials, or equipment are necessarily the best available for the purpose.



WWW.CHIPS.GOV

.....

askchips@chips.gov