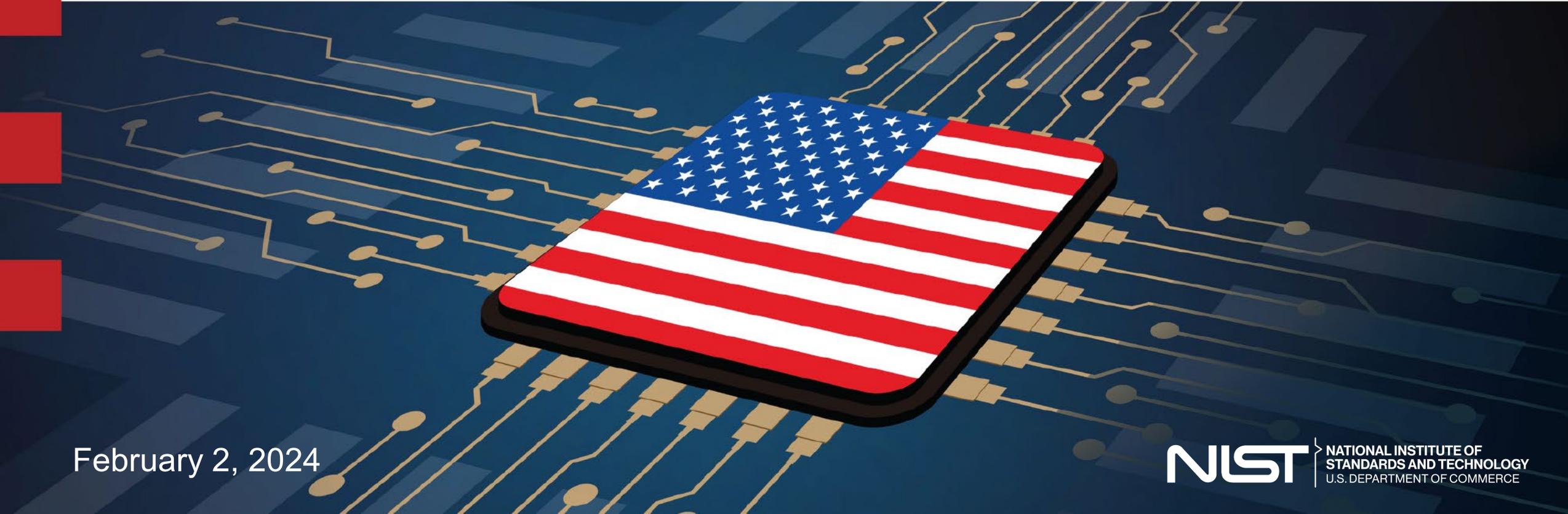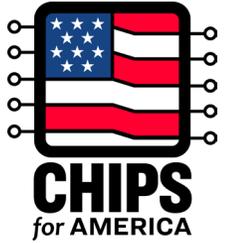# CHIPS Manufacturing USA Institute

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February 2, 2024

Disclaimer

- Statements and responses to questions about advanced microelectronics research and development programs in this webinar:
  - Are informational, pre-decisional, and preliminary in nature.
  - Do not constitute a commitment and are not binding on NIST or the Department of Commerce.
  - Are subject in their entirety to any final action by NIST or the Department of Commerce.
- Nothing in this presentation is intended to contradict or supersede the requirements published in any future policy documents or Notices of Funding Opportunity.

CHIPS for America
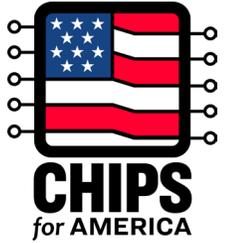
$39 billion
for incentives

Two component programs to:

1. Attract large-scale investments in advanced technologies such as leading-edge logic and memory, and advanced packaging
2. Incentivize expansion of manufacturing capacity for mature and other types of semiconductors

$11 billion
for R&D

Four integrated programs to:

1. Conduct research and prototyping of advanced semiconductor technology
2. Strengthen semiconductor advanced packaging, assembly, and test
3. Enable advances in measurement science, standards, material characterization, instrumentation, testing, and manufacturing

Plus CHIPS initiatives from other agencies, including DOD, State, NSF, and Treasury
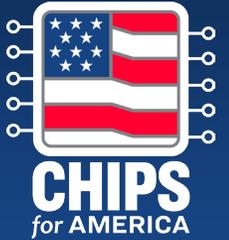
Workforce Initiatives

CHIPS R&D

Vision   A vibrant and self-sustaining U.S. domestic semiconductor ecosystem that revitalizes American manufacturing, grows a skilled and diverse workforce, and leads the world in semiconductor research and innovation.
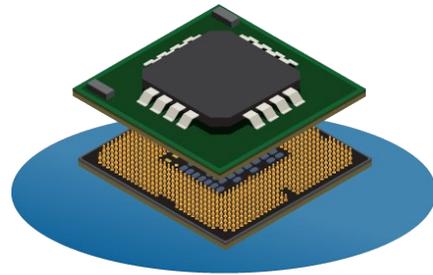
Mission   Accelerate the development and commercial deployment of foundational semiconductor technologies by establishing, connecting, and providing access to domestic research efforts, tools, resources, workers, and facilities.
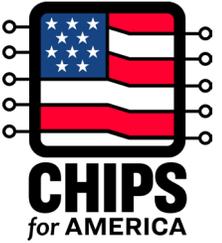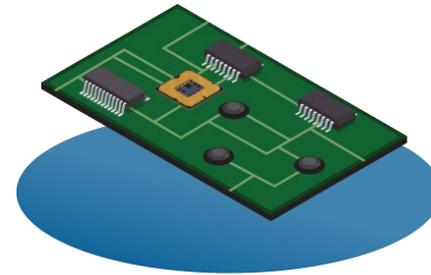
CHIPS R&D Programs

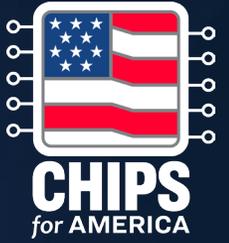**Metrology**

National Semiconductor Technology Center

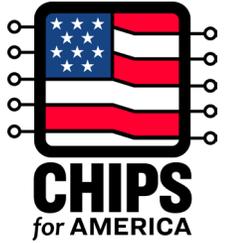**National Advanced Packaging Manufacturing Program**

Manufacturing USA Institute

**Workforce Initiatives**

Notice of Intent

CHIPS Manufacturing USA Institute

- Establish one institute with the potential for significant impact on semiconductor manufacturing

- Topic: Digital twins

- Minimum expected NIST commitment ~$200 million over a five-year period

- Anticipate a greater than 1:1 cost share

- Analysis of RFI responses, industry feedback, listening sessions across 15+ engagements, and technology opportunities across the CHIPS R&D portfolio.

What is a digital twin?

- A **virtual** representation or model that serves as the real-time digital counterpart of a physical object or process.

- Benefits
  - Innovate faster and at less expense
  - Access feasible for small and medium businesses
  - Enhance training modalities
  - Shorten process design and validation times
  - Improve facility performance

- Challenges
  - Being able to produce and access the **data** needed to validate digital twins and power machine learning and AI tools
  - Strategic industry **collaboration**, which requires a neutral convener to build trust and bring together all parties to share the risks and rewards of working across boundaries
  - Significant **financial investment**, which is out of reach for small and medium-sized manufacturers to do themselves

Digital twin

AI analytics + decision making

Synchronization

Real-world object
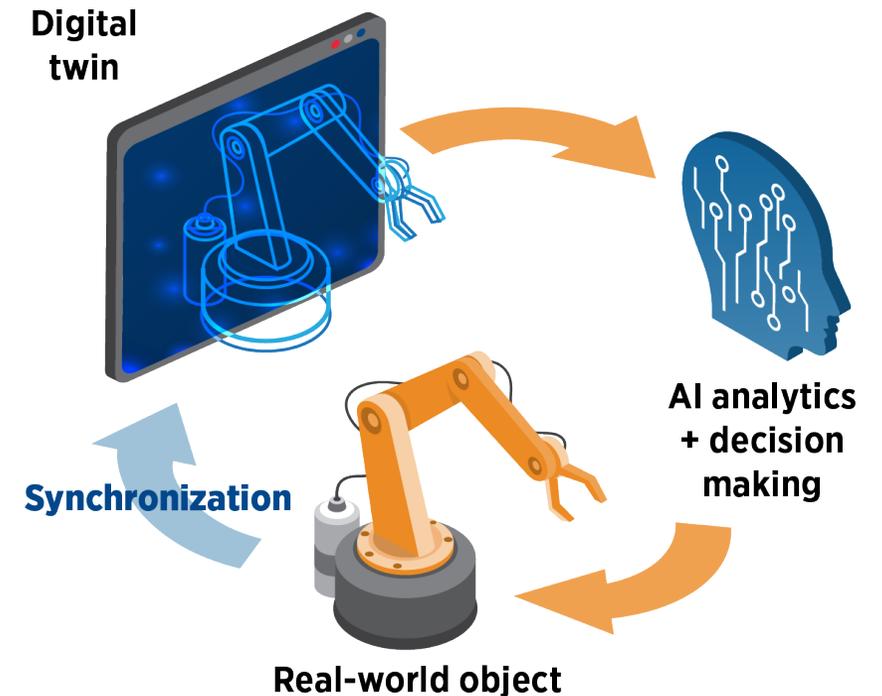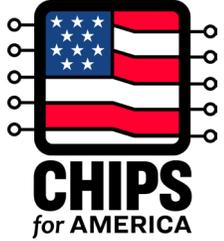
Digital Twin Institute
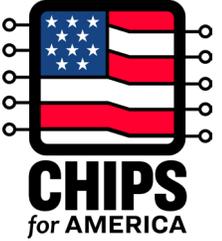
Vision

Enable **seamless integration of digital twin models** into the U.S. semiconductor manufacturing, advanced packaging, and assembly industries, enabling rapid adoption of innovations and enhancing domestic competitiveness for decades.

Mission

Foster a **collaborative environment** within the domestic semiconductor industry, enabled by the world's first **shared** semiconductor Digital Twin process **validation facility**, industry-relevant research projects, and digital-twin supported workforce training.

Digital Twin Institute Objectives

Reduce the time and cost for chip development and manufacturing

Accelerate the adoption of semiconductor manufacturing innovations

Increase access to semiconductor manufacturing training through the adoption of digital twin-enabled tools

Expand access to digital twin tools, solutions and frameworks

Digital Twin Institute Approach

A physical facility and digital framework, integrated with industry-led research projects

**1** Establish a **shared physical facility**

Expected activities:
- Baseline facility testbed
- Digital emulation hardware
- Core technical & operations staff

2 Competitively fund **industry-led technical and workforce development projects**

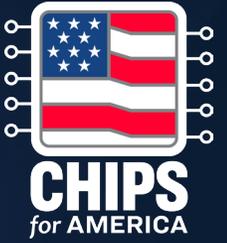Deliver technical solutions, de-risk new tools, and conduct data analysis

Develop and test education & workforce development tools enabled by digital twins
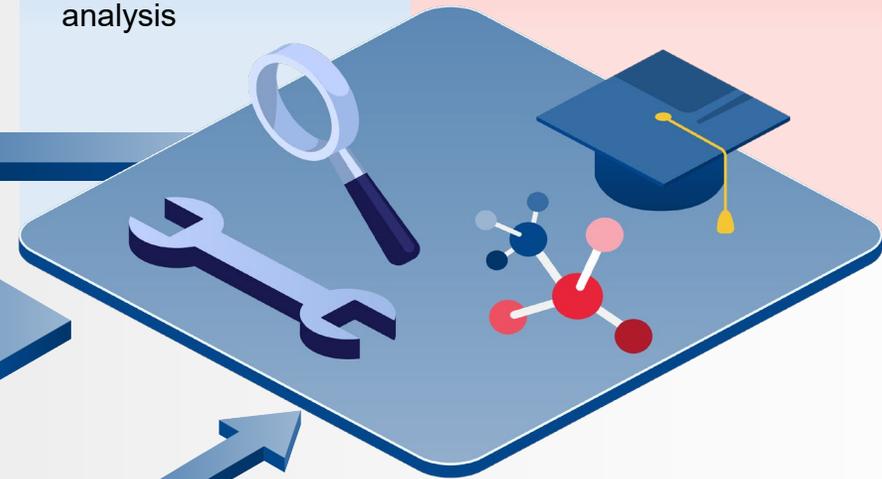
3 **Digital framework** for interoperable data and models

Data analysis tools

DT+

Full process flows

4 Create a **shared marketplace** of digital twin models

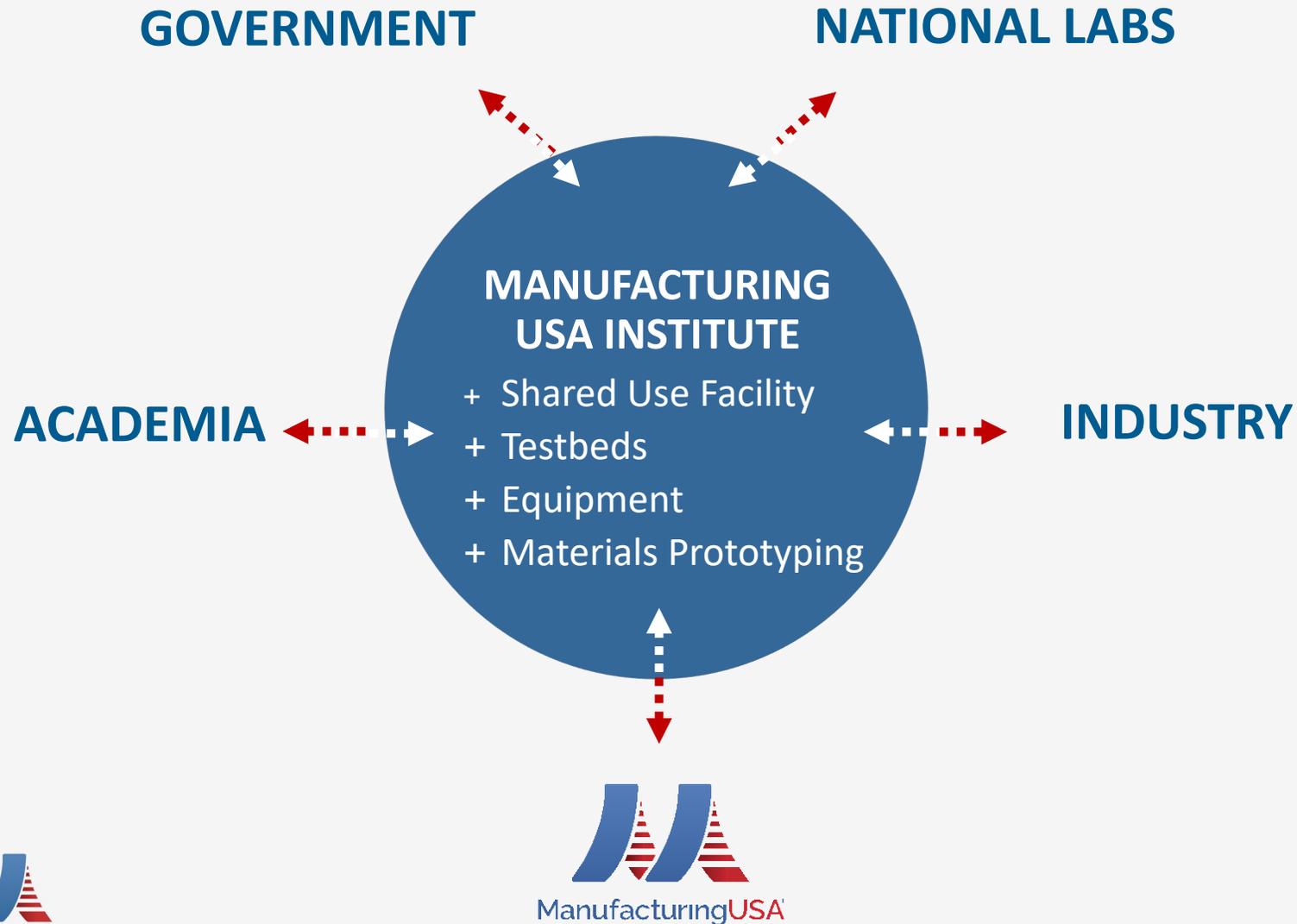Manufacturing USA

Manufacturing USA Vision and Mission

VISION: Securing U.S. Global Leadership in Advanced Manufacturing

MISSION: Connecting people, ideas, and technology to:

- solve industry-relevant advanced manufacturing challenges
- enhance industrial competitiveness and economic growth
- strengthen our economic and national security

Institute Partnership Model

GOVERNMENT

NATIONAL LABS

ACADEMIA

MANUFACTURING USA INSTITUTE

+ Shared Use Facility
+ Testbeds
+ Equipment
+ Materials Prototyping

INDUSTRY

ManufacturingUSA

Common Institute Design:

- Industry-led public-private partnership

- Typically $70-120M federal investment

- At least 1:1 match with private funds

- Neutral convening for collaborations

- Each institute develops a unique technology

- Institutes address the education and workforce skills gap for their technologies

Next Steps
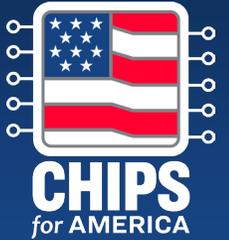
- Notice of Funding Opportunity — Spring of 2024

- Webinars and Proposer Days

- Sign up for emails from CHIPS.gov for details on webinars, events, and funding opportunities
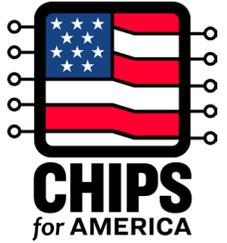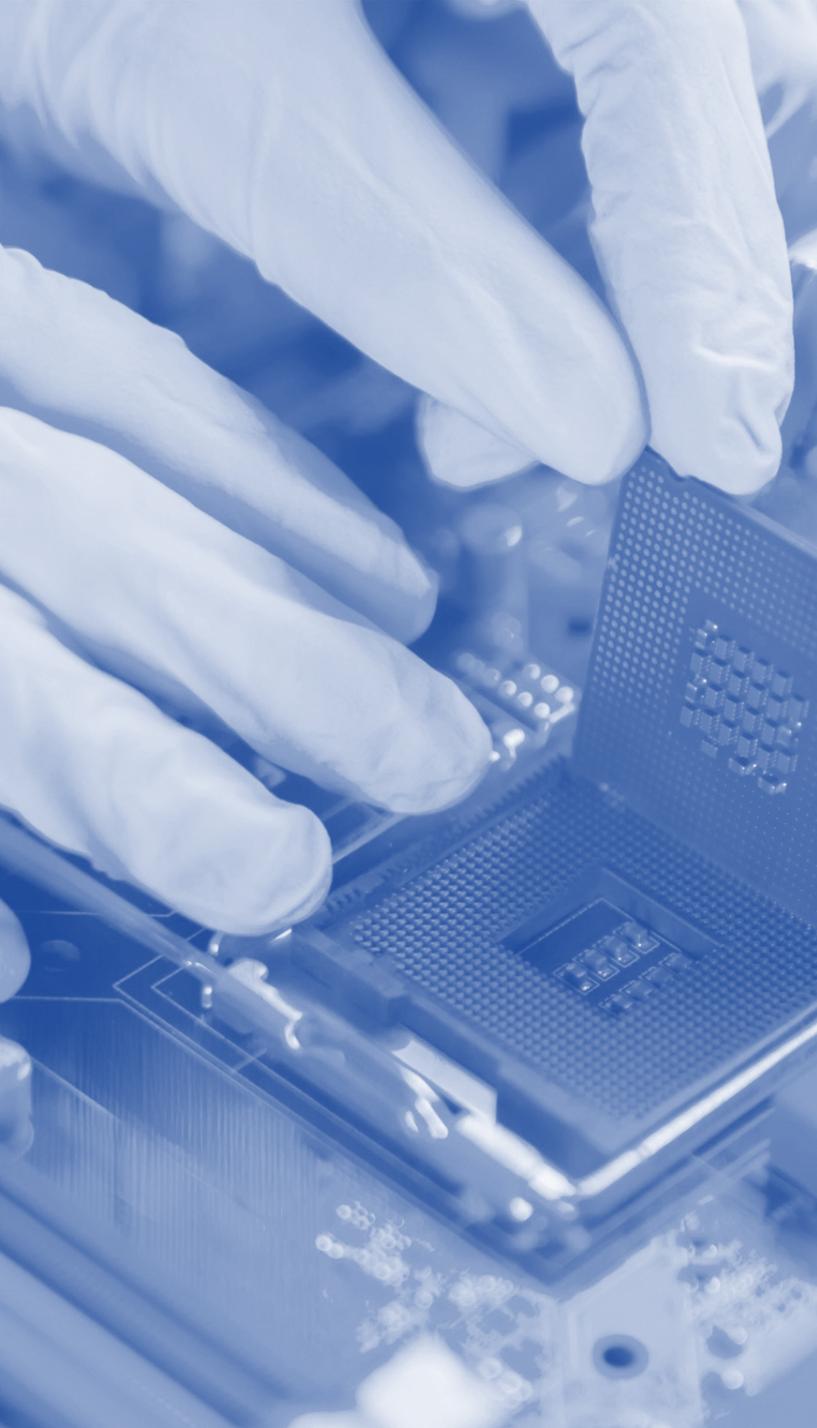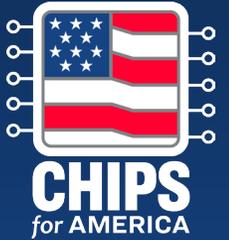
Industry Day

LEARN MORE, SHARE YOUR FEEDBACK

- February 12, 2024

- 12:30 pm ET

- Virtual

- The Industry Day will include a short webinar followed by
    - Two breakout sessions
    - One-on-one sessions with signup

- Learn more and register at CHIPS.gov
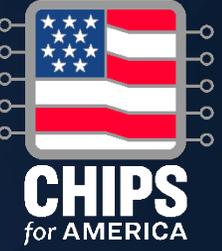
Frequently Asked Questions

The CHIPS Act indicates up to three institutes. Why will there be just one?

- After receiving extensive public input, the CHIPS R&D office determined that a single institute with both regionally-focused programs and meaningful cross-region participation will best meet the CHIPS for America goals of strengthening U.S. technology leadership, accelerating ideas to market, and realizing a robust semiconductor workforce.

- In establishing a single institute with national reach, CHIPS for America seeks to enable the seamless integration of digital twin models into U.S. semiconductor manufacturing, advanced packaging, and assembly, enabling rapid adoption of innovations and enhancing domestic competitiveness for decades to come.
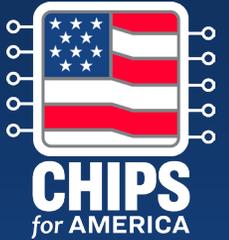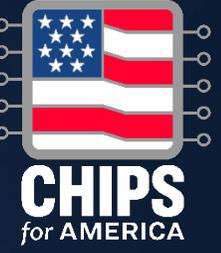
How will the new institute work with other programs?

- The institute is expected to collaborate closely with other CHIPS for America programs including CHIPS Incentives and with microelectronics R&D programs supported by other U.S. federal agencies.

- The institute will be part of the Manufacturing USA network and will closely work with existing institutes developing digital twins for broader manufacturing sectors.
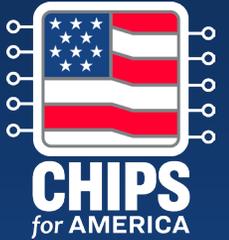
What is the expected cost-share of this institute?

- For general planning purposes, the minimum expected NIST commitment will be approximately $200 million over a 5-year period.

- CHIPS for America expects to leverage private sector and other non-Federal investments on a substantially greater than 1:1 basis.

Thank you