

Semiconductor R&D Path to Manufacturing

Int'l. Conference & Exhibition on Device Packaging

March 15, 2023

ARIZONA
COMMERCE AUTHORITY



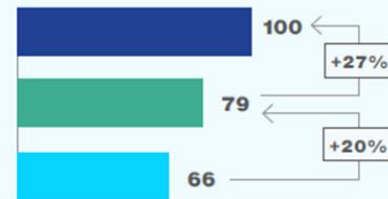
Manufacturing Economics: Asia, US, China

Estimated 10-year Total Cost of Ownership (TCO¹) of reference fabs by location (US indexed to 100)

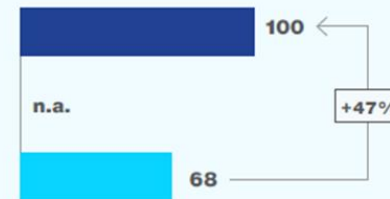
Advanced Logic



Advanced Memory

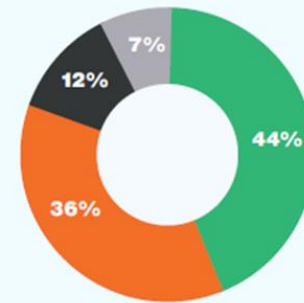
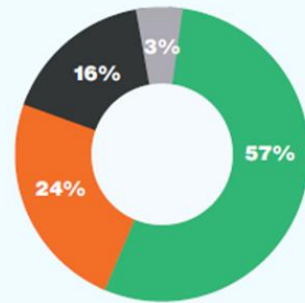
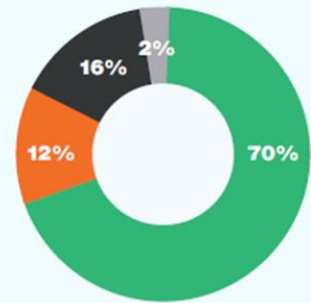


Advanced Analog



What drives the higher TCO of US-based fabs % of incremental TCO for US-based fabs

Government incentives Construction Labor Utilities



1. TCO includes capital expenditure (upfront land, construction and equipment) + 10 years of operating expenses (labor, utilities, materials, taxes) 2. Refers to Taiwan and South Korea for logic, South Korea and Singapore for memory 3. With technology sharing agreements that give access to additional incentives such as equipment lease back with advantageous terms
Source: BCG analysis

Source: SIA-BCG Strengthening the Global Semiconductor Supply Chain in an Uncertain Era 2021

Process & Culture?

Arizona Cluster Size, Incentives, Site Identification and Workforce

U.S. SEMICONDUCTOR INNOVATION POLICY LANDSCAPE

To ensure continued U.S. leadership in the global semiconductor industry, the U.S. must advance an ambitious competitiveness and innovation agenda.

1. Invest in U.S. Semiconductor Leadership:

- Implement the policies and programs in the CHIPS and Science Act efficiently, promptly, and transparently.
- Devise regulations for the advanced manufacturing investment credit in the CHIPS Act to encompass the full scope of investments in the semiconductor ecosystem.
- Adopt policies to promote innovation and U.S. competitiveness, such as enacting an investment tax credit for semiconductor design and strengthening the R&D tax credit.
- Maintain U.S. technology leadership by investing in the research and science programs authorized by the CHIPS and Science Act.

- Secure funding to strengthen the semiconductor workforce at all levels and ensure a robust pipeline at all education levels and skills needs.

3. Promote Free Trade and Protect IP:

- Approve and modernize free trade agreements that remove market barriers, protect IP, and enable fair competition.
- Expand the Information Technology Agreement, one of the World Trade Organization's most successful free trade agreements.

4. Cooperate Closely with Like-Minded Economies:

- Align policies and regulations with like-minded allies to strengthen national security, promote growth, innovation,



- ✓ Local practices to leverage CHIPS funding
- ✓ R&D tax credits
- ✓ Policies (and activities) to promote innovation and investment

SIA State of the US Semiconductor Industry 2022

Why Manufacture in Arizona?

- ✓ Among the largest and broadest semiconductor sectors
- ✓ Home of the large new semiconductor manufacturing facilities
- ✓ *(Intel, TSMC, others exceeding \$60B since 2020)*
- ✓ Suppliers are following
- ✓ *(21 new or expansions since 2020)*
- ✓ NSER and Arizona Semiconductor Task Force
- ✓ Reduce geopolitical risk
- ✓ Near zero natural disasters risk
- ✓ Among the most significant incentives of any state
- ✓ Strong state, community and college R&D and manufacturing training partnerships

Arizona's Robust Semiconductor Sector



ARIZONA IS LEADING A NATIONAL EFFORT TO ACCELERATE GLOBAL IMPACT



Amidst heightened global demand, **the state of Arizona facilitated the launch of an industry-led effort called the National Semiconductor Economic Roadmap (NSER).** The coalition brings together industry, academic and state partners to chart a path through which the United States can **innovate and improve its infrastructure, supply chain, workforce and entrepreneurship to increase efficiency across the entire value chain and maintain U.S. competitiveness in the long term.** Committees were formed around each of these four pillars, overseen by an executive steering committee of industry leaders.

The NSER roadmap, which is intended to be a living document, will **serve as the blueprint for the future of the industry.** The partnership with NSER's four committee chairs, the **Arizona Commerce Authority was proud to brief the CHIPS Program Office on the key insights from the roadmap, and will continue to engage with federal partners in advance of the upcoming launch in December 2022.**



INDUSTRY		ACADEMIA	
Ambature	Micron	Arizona State University	University of Arizona
Amkor Technology	MoovTechnologies	Northern Arizona University	University of California, Santa Barbara
Applied Materials	NXP	Pasadena City College	University of Texas at Austin
ASM	onsemi	Portland Community College	
BDO	Terecircuits		
Dexcom	Tower Semiconductor		
DuPont	TSMC		
EMD Group	Samsung		
Ereztech	Samsung Catalyst Fund		
IBM	SkywaterTechnology		
Intel	Sunlit Chemical		
Isola Group	Synopsys		
MediaTek	Qualcomm		
MicrochipTechnology			
TRADE ASSOCIATIONS		CONSULTANTS	
SEMI		BCG	
SEMIFoundation		Innovation Impact	
SIA		mySiliconCompass	

Globally Connected Arizona Foreign Offices



SEOUL
SOUTH KOREA

CHIHUAHUA
MEXICO

GUANAJUATO
MEXICO

EUROPE
FRANKFURT, GERMANY

TAIPEI
TAIWAN

MEXICO CITY
MEXICO

TEL AVIV
ISRAEL

Pro-Business Environment

2.5%

INDIVIDUAL INCOME TAX
LOWEST FLAT TAX IN THE NATION

NO

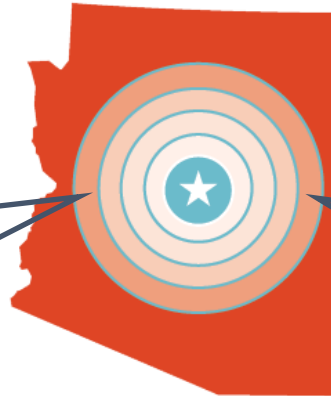
FRANCHISE TAX
BUSINESS INVENTORY TAX
ESTATE TAX
WORLDWIDE UNITARY TAX
GROSS RECEIPTS TAX

4.9%

CORPORATE INCOME TAX
ONE OF THE LOWEST IN THE NATION

ARIZONA IS A

right
to work
STATE



TOP 10 OVERALL

freedom
from
regulation

State Policy Reports, 2021

Arizona Programs (New Benefits)



QUALIFIED FACILITY

The Qualified Facility program provides a refundable income tax credit of up to **\$30,000** for qualifying manufacturing capital investment and net new job creation projects.
NEW: Available to R&D and HQ.



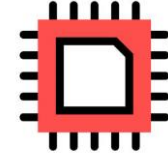
QUALITY JOBS

The Quality Jobs tax credit provides a \$9,000 income tax credit against Arizona income tax liabilities for each new qualifying full-time job created over a three-year period



TPT EXEMPTION FOR MANUFACTURERS

Exemption from sales tax on utilities, manufacturing equipment, materials and chemicals purchases, construction materials,



TPT EXEMPTION FOR SEMICONDUCTOR

Exemption from sales tax on clean room construction and installation and those for manufacturers.



FOREIGN TRADE ZONE

Businesses located in a zone or sub-zone are eligible for up to a 72 percent reduction in state real and personal property taxes.



ARIZONA ADDITIONAL DEPRECIATION PROGRAM

Accelerates depreciation by reduction of personal property taxes
NEW: Reduces tax to 2.5% for all equipment.



RESEARCH & DEVELOPMENT

The R&D tax credit provides an Arizona income tax credit for increased research and development activities conducted in this state.

Arizona Leads Incentives, Site Identification and Workforce



THANK YOU

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