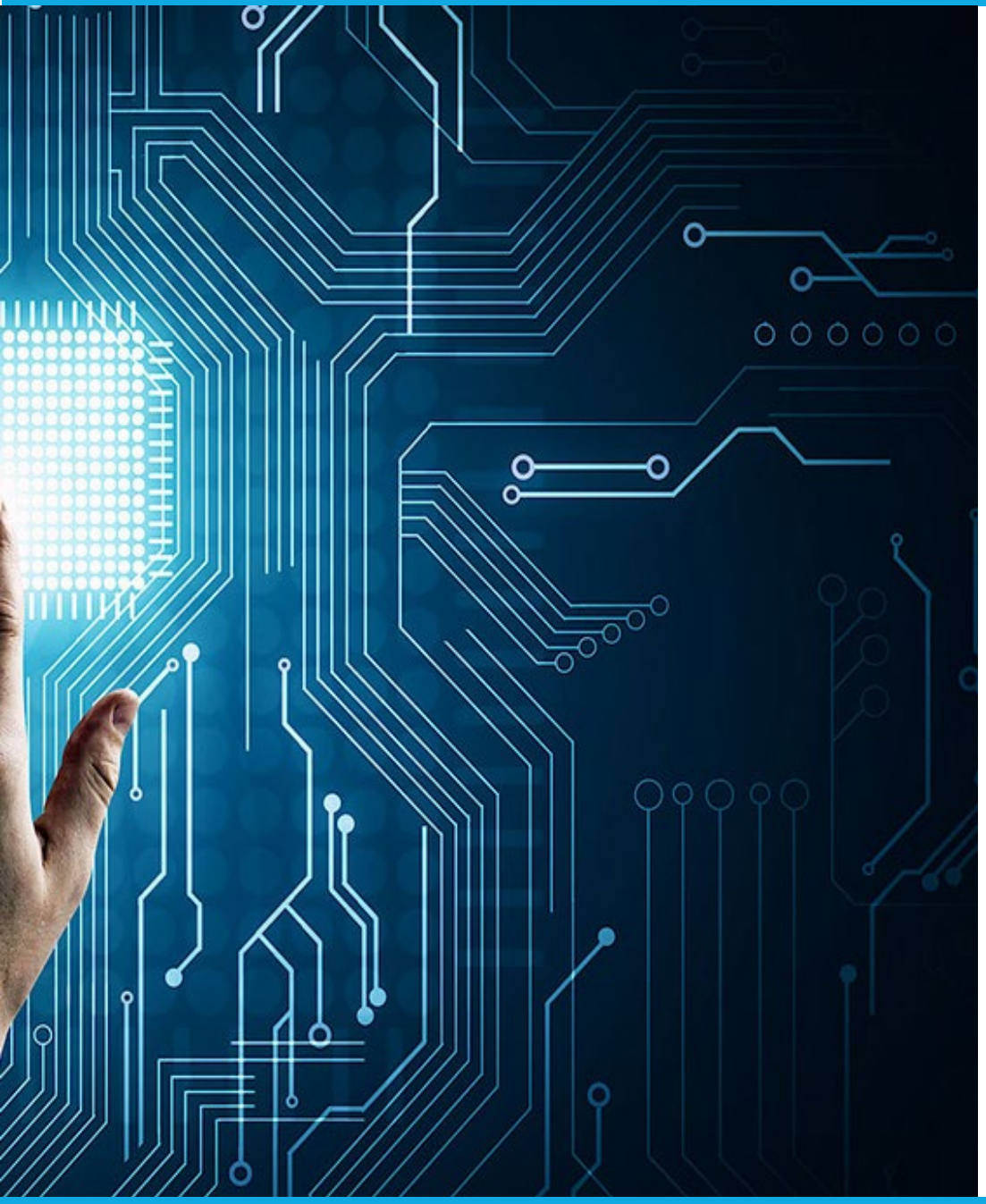
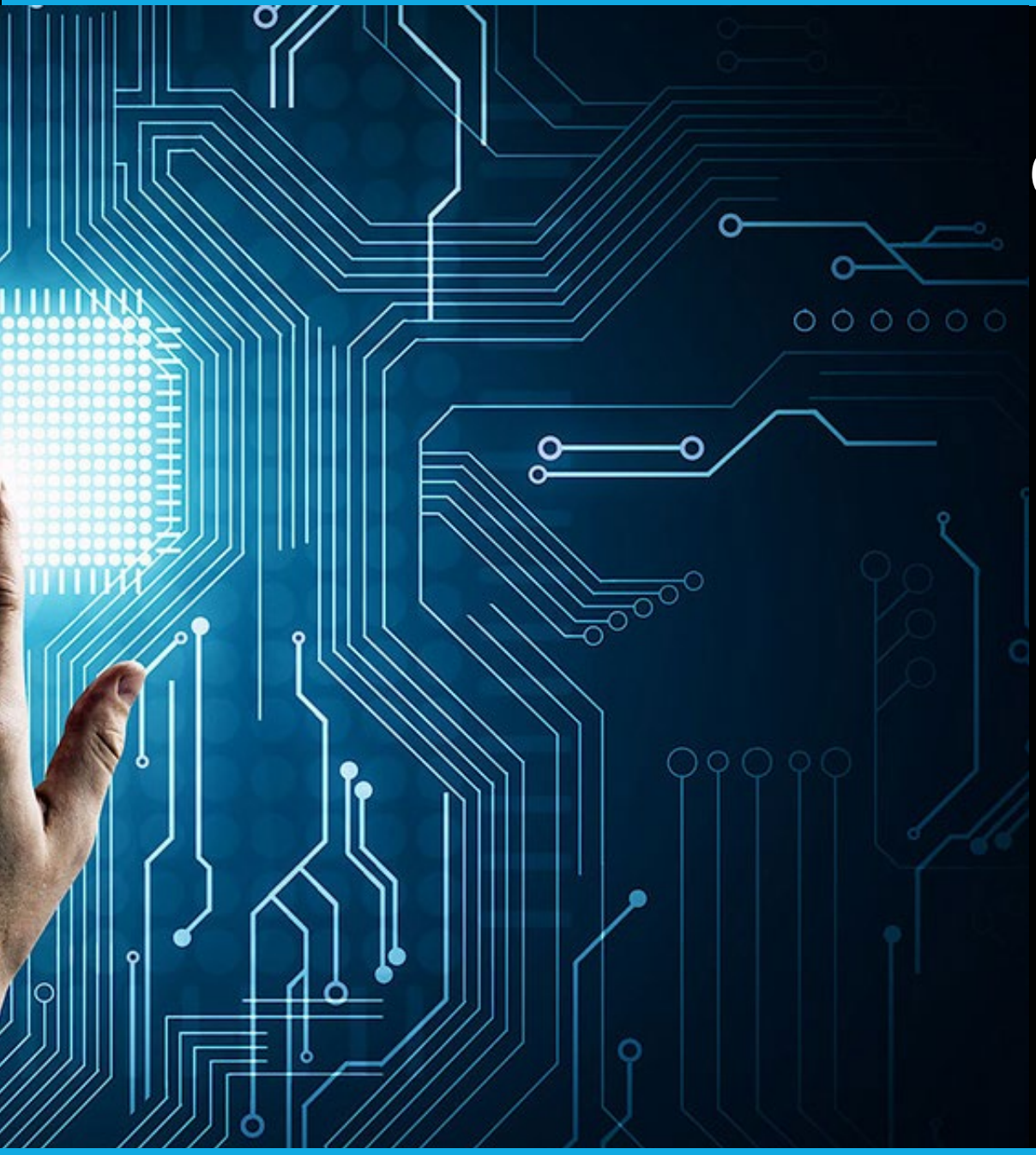


The Chip Value Chain & Australia's Angle

Kevin Crofton, Chair Adisyn

Pitt Street Research Semiconductor Conference

7 May 2025



Outline

Insatiable Societal Forces

A Look At The Semi Industry

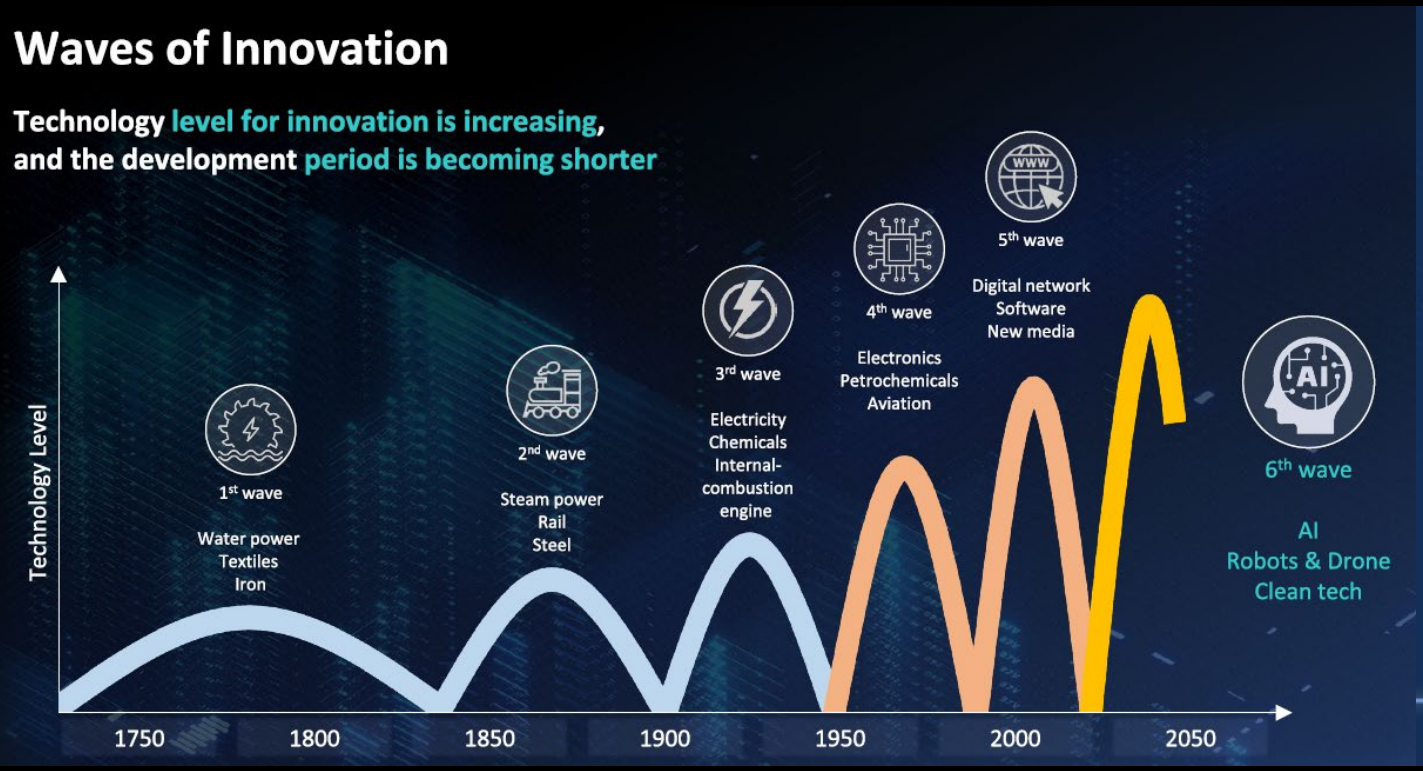
The Interconnect Dilemma

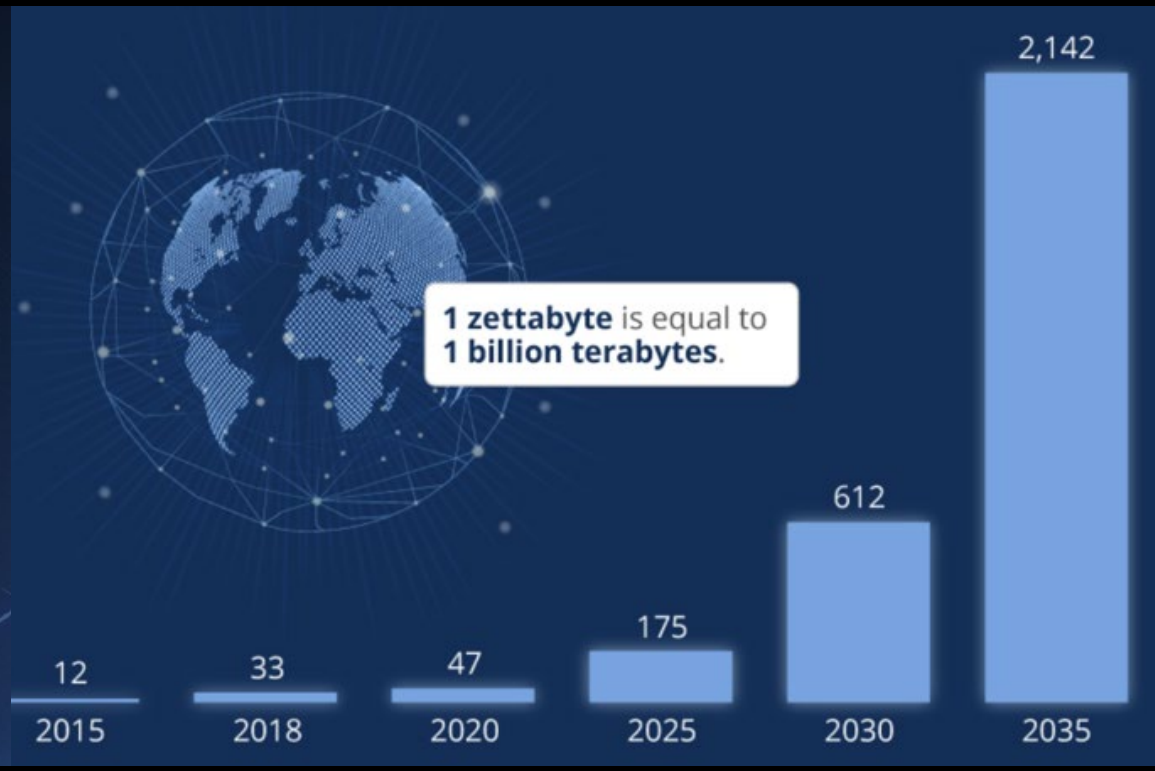
Some Opportunities for Australia

Summary

We've Entered An Era Driven By Data Processing on Massive Scale….

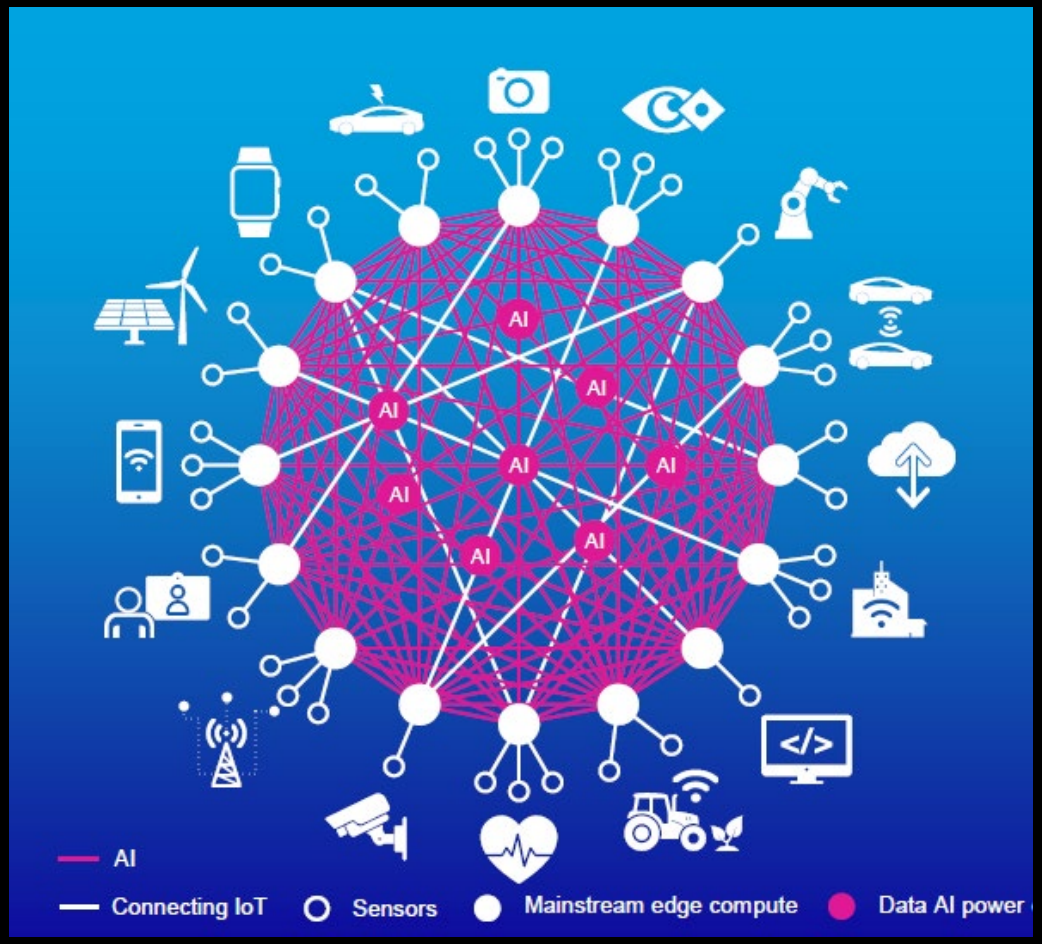
Generative Artificial Intelligence, Data Centers, High Performance Compute, Smart Health…

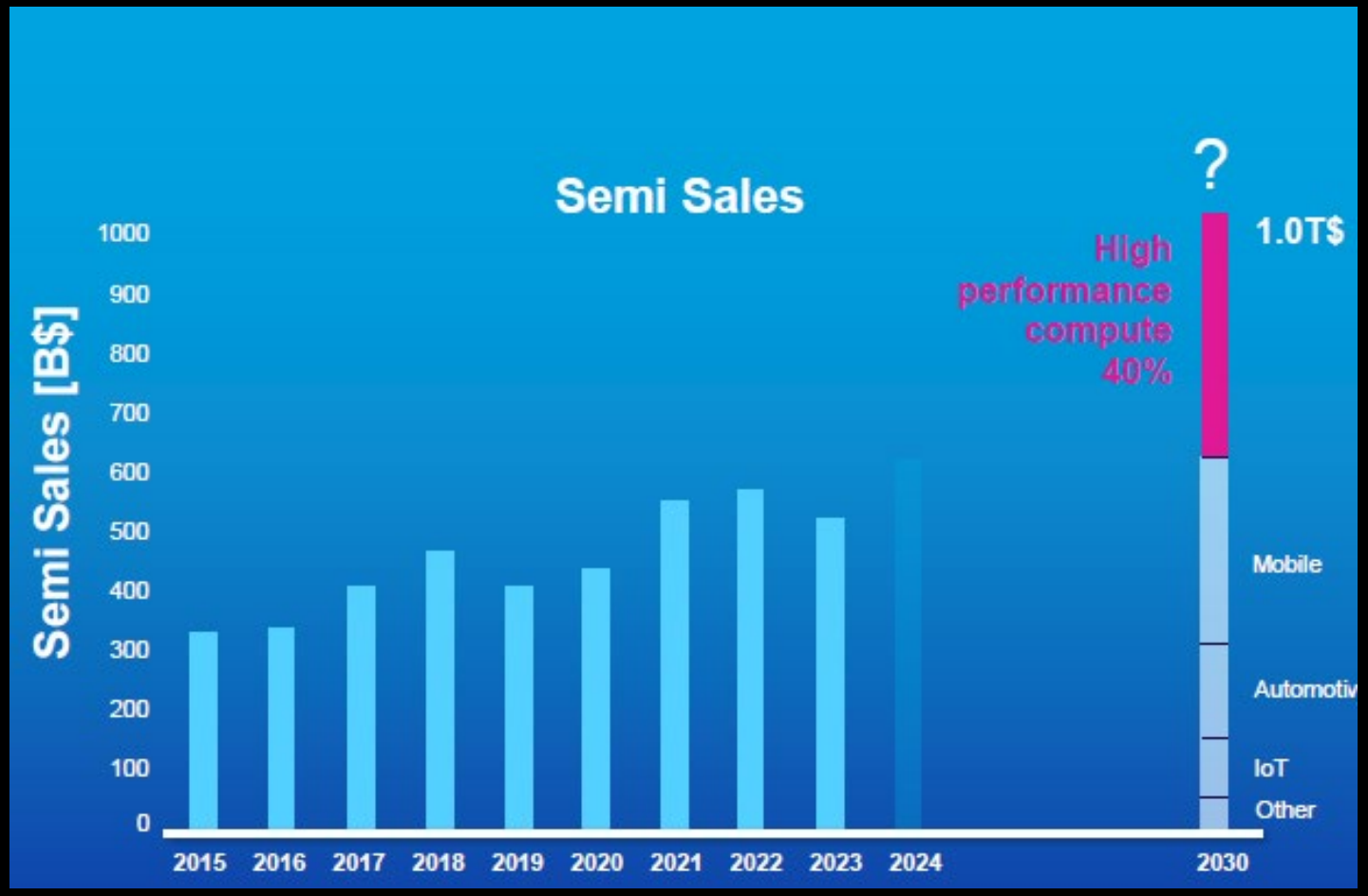




The Semiconductor Industry

Semiconductor Market in 2030….

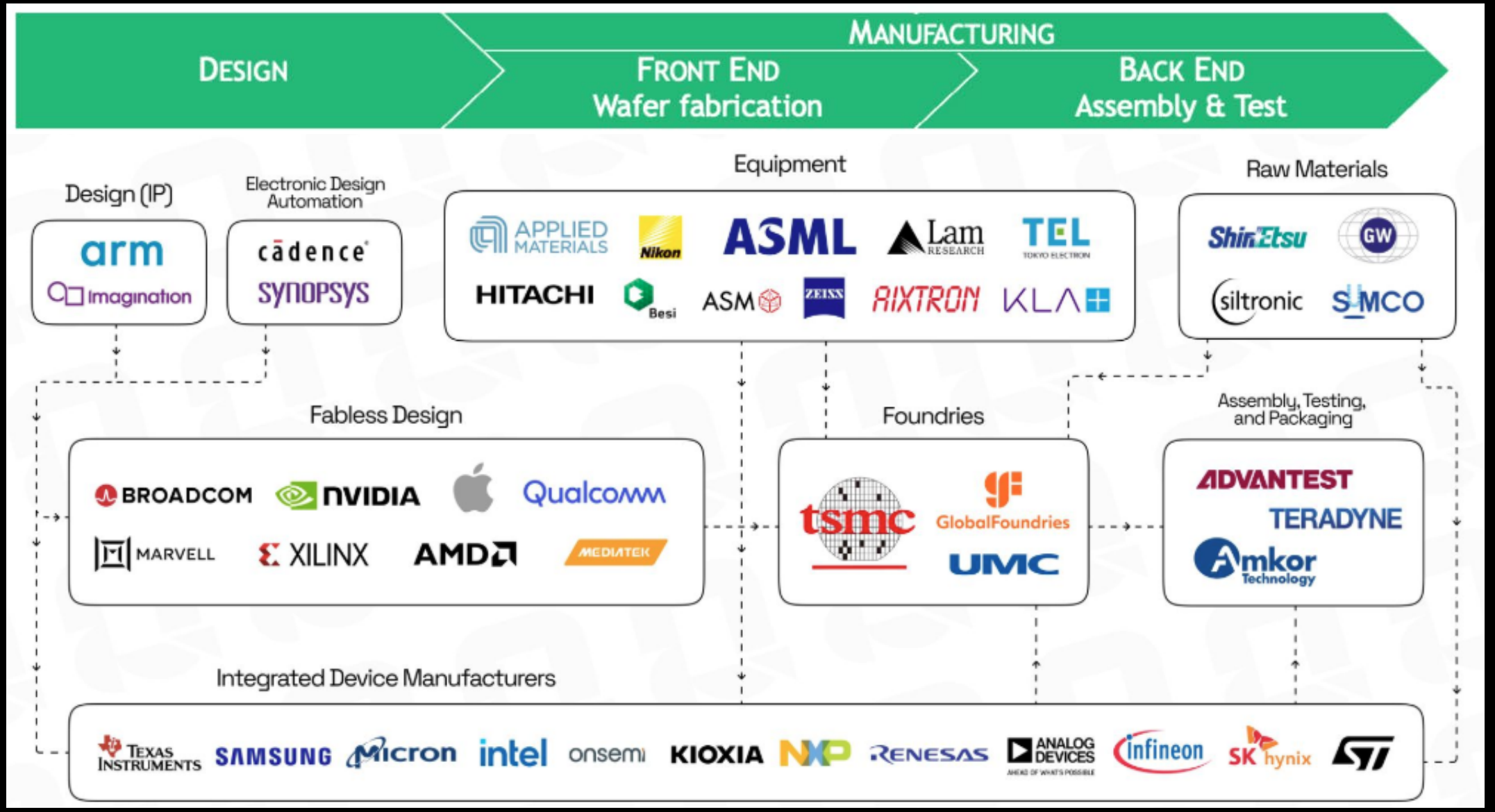




High Performance Computing/AI Doubles The Semi Industry c.5 years

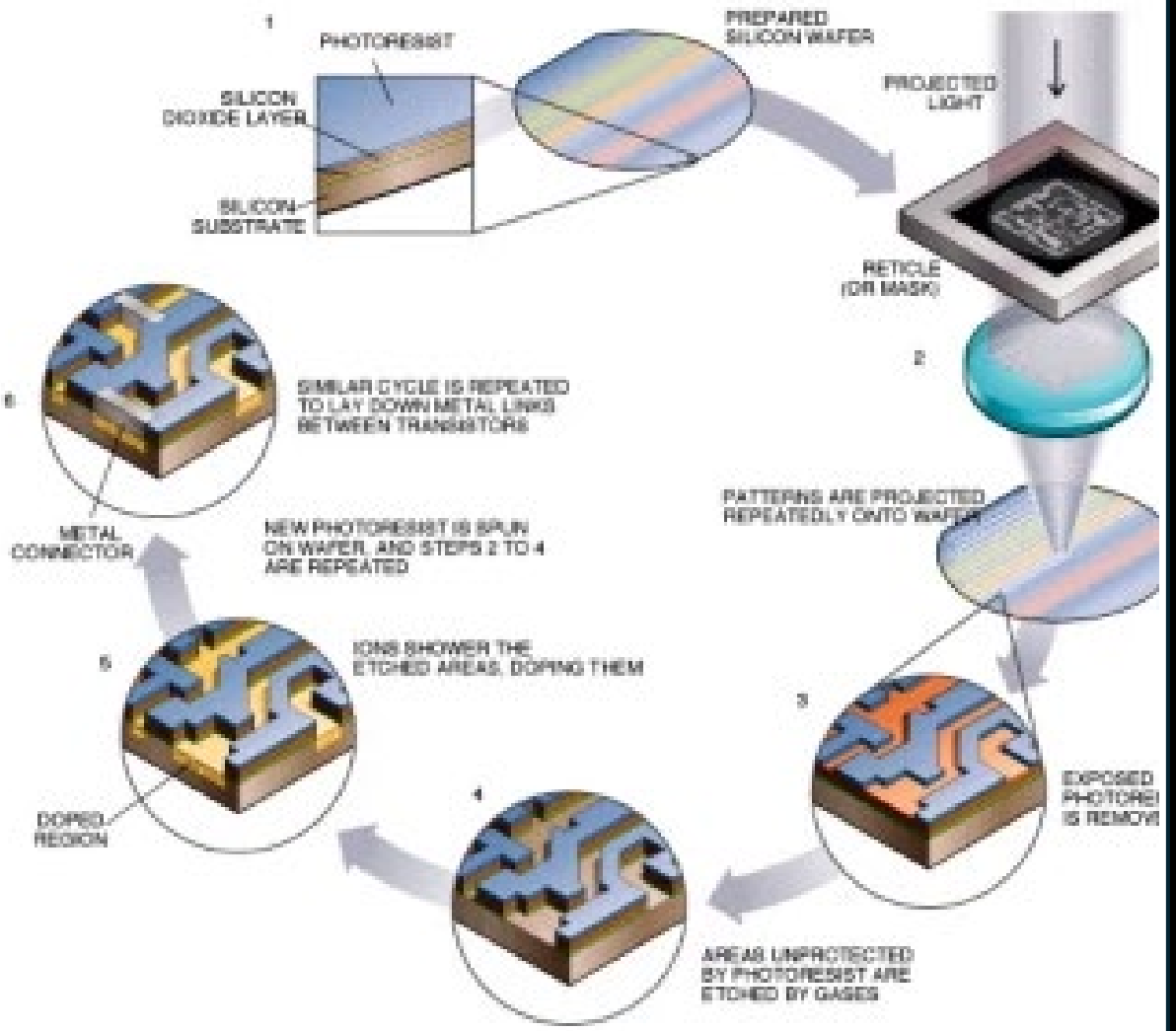
AMD (CEO: Su): Chips for AI *alone could be $500Bn by 2028!*

Some Key Players in the Value Chain

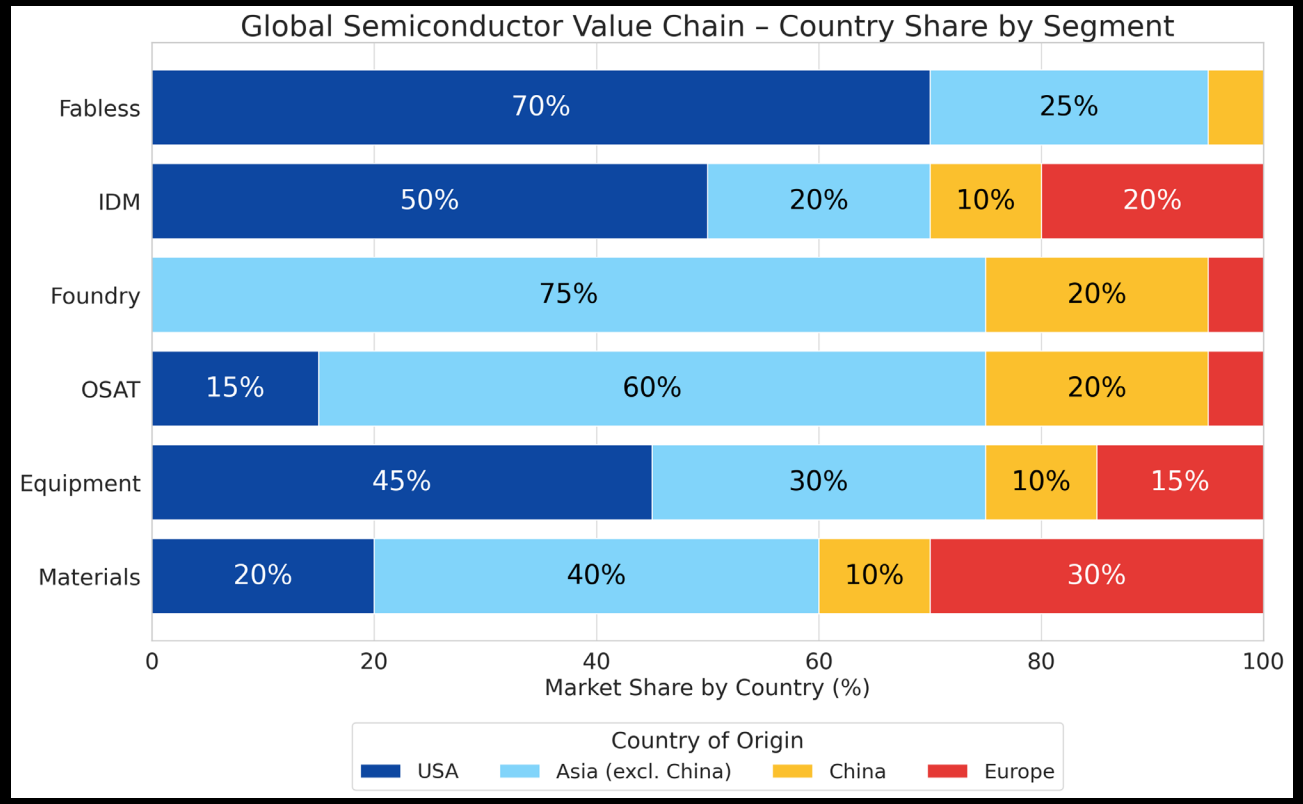


General Process Flow to Make A Device

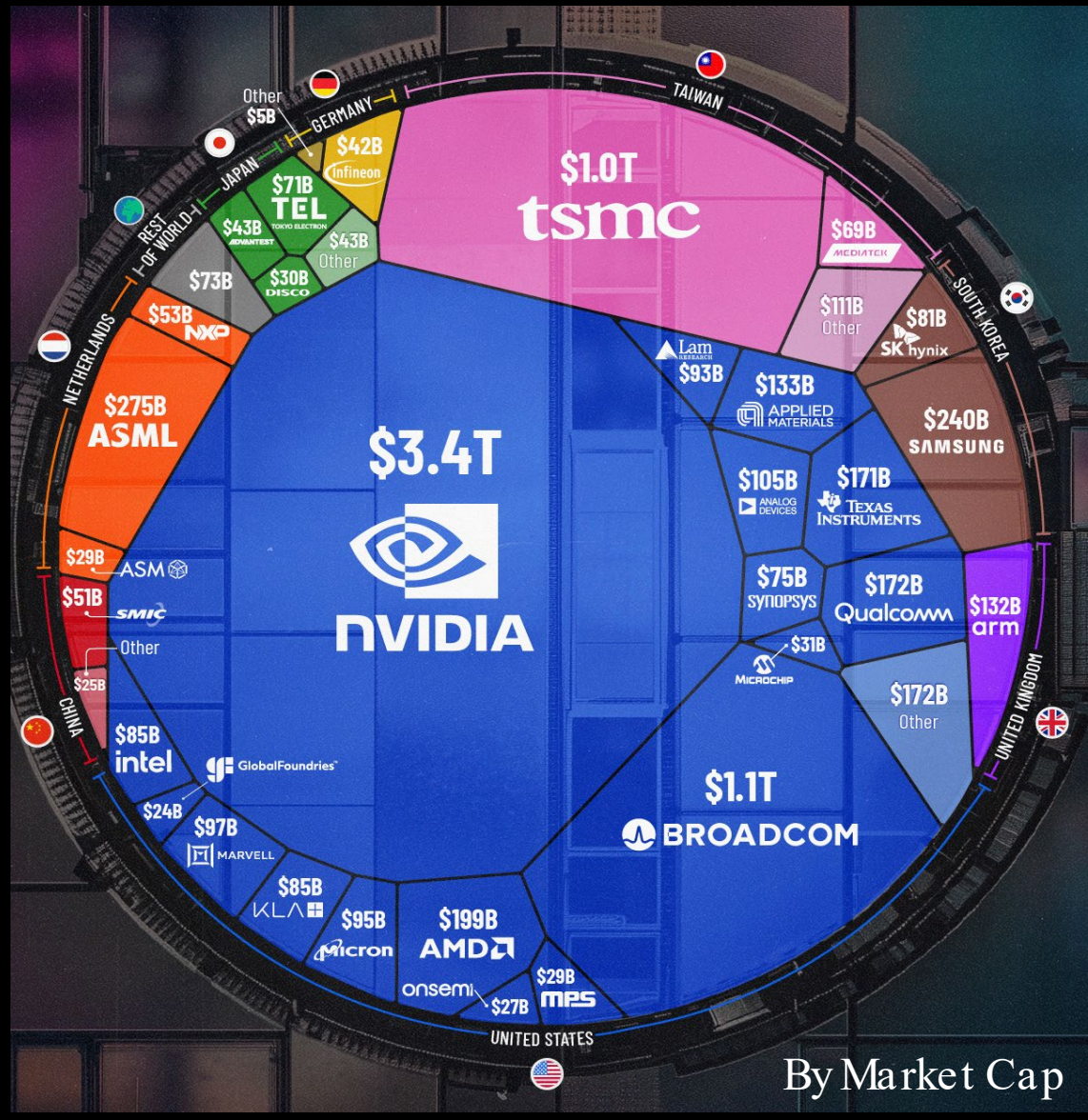
Semiconductor Chip Manufacturing Process



Semiconductor Industry Food Chain



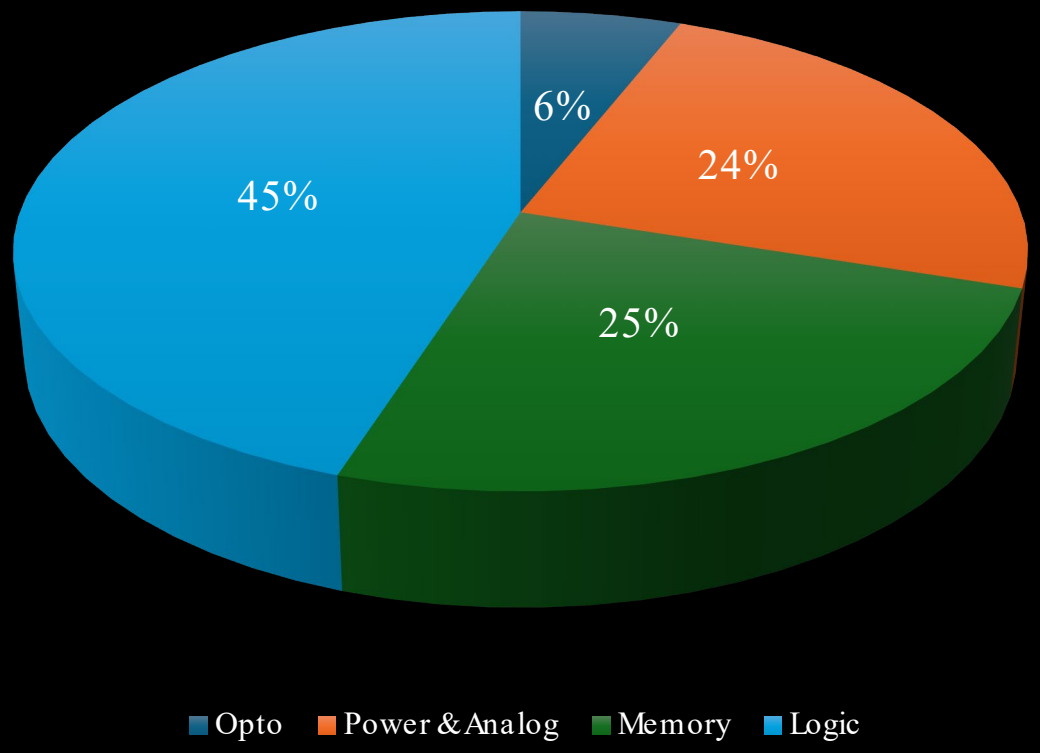
By Activity



By Market Cap

Global Market By Device Type

Est. ‘24: $627.6 Bn USD; $700Bn in ‘25



The $1T USD Market by c. 2030

Logic & Memory : 13% & 11% CAGR

HPC, AI, Industry 5.0, Smart Med, Automotive for on-board decision making

Power & Analog : CAGR 8%

EV, Power Management (systems & Grids)

Opto & Sensors : CAGR 6%

Augmented Reality and Extended Reality

Home Automation &Energy Efficiency

Source Deloitte Insights (7 April 2025) and Infosys Semiconductor Outlook 2025 (NYSE: INFY)

Inside a leading –edge Device Manufacturing FAB

$3B+ Investment Required
Leading-edge fabs cost billions to build and equip

X,000+ Process Steps
many 00's at the **nano-scale** precision

24/7 Production
40 wafers/hour, **365 days/year** non-stop operations

>90% Yields at Scale
Precision and repeatability

Some "Lights-Out" Fabs
Fully automated environments with **minimal human intervention**

>2,000
PROCESS STEPS

There Are Industry Headwinds

Supply Chain

Trade Barriers
Export Controls
Raw Material Shortages (Neon, rare earth metals)
Dealys in Fab Start Ups

Geopolitical Strife

Delays in Fab builds
US-China, US-Europe, Taiwan Tension
Ukraine War
Trade Wars
Limiting transfer of talent

Access to Sustainable Power

Rising Energy and Water Demands:
Data Center Power Consumption to Double by 2026
Fabs will Consume c. 240TWh by 2030

Talent Shortage

Researchers
Skills Shortage
Chip Design
Geopolitical Strife Limiting Immigration

Cyber and IP Security

IP Theft, Cyberattacks
Data Leaks (nternal & External)

Let’s Talk About Geopolitical Headwinds

Geopolitical Strife

Delays in Fab builds
US-China, US-Europe, Taiwan Tension
Ukraine War
Trade Wars
Limiting transfer of talent

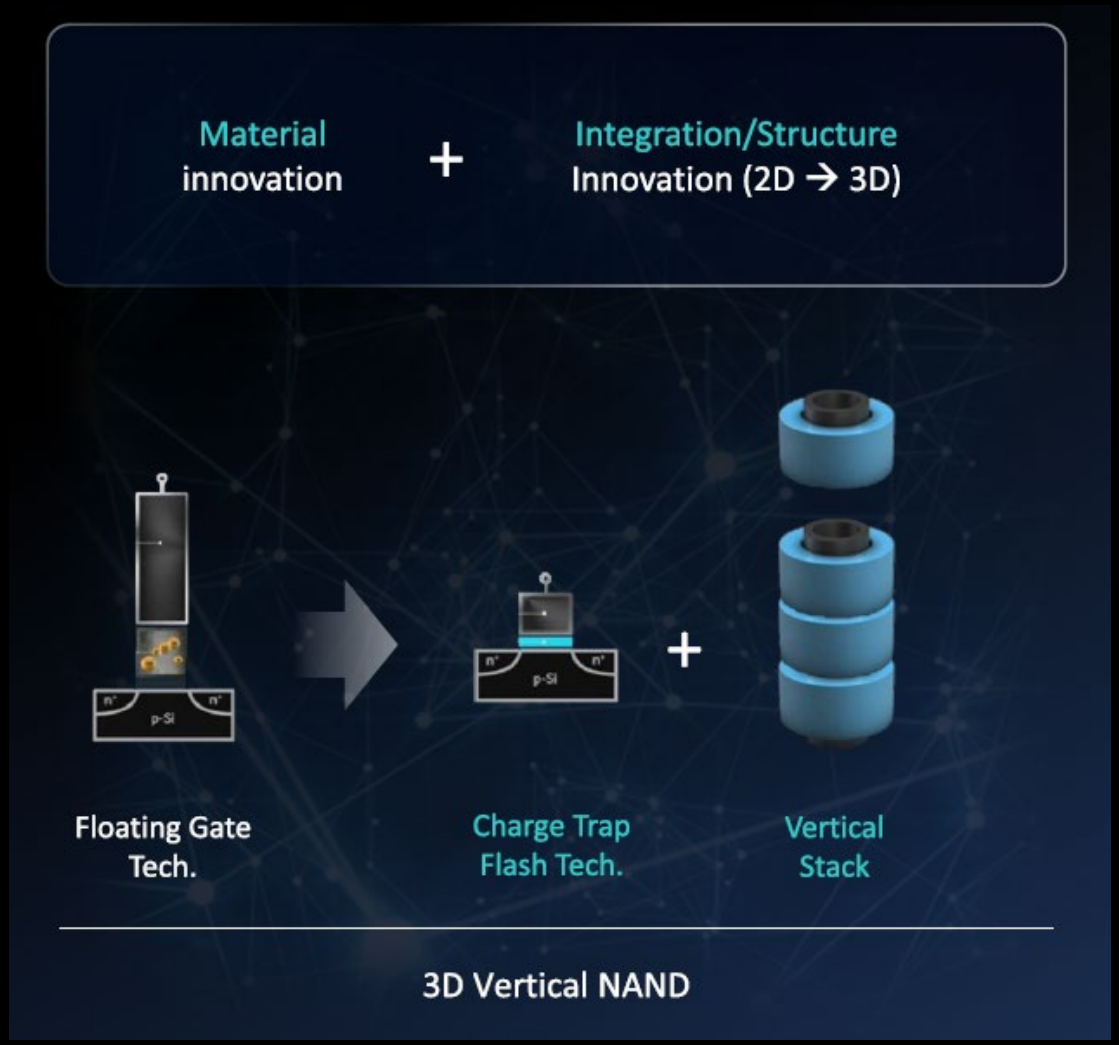
4 Regions, +4 States, 3 trips around the world, 100 Days production lead-times

The Interconnect Challenge

The interconnect dilemma & the drive for Moore's Law

Quest For Higher Speed, Lower Power, Less Heat , At the same base cost

1. High **Performance** : Increasing Speed
2. Low **Power** : Reducing power consumption
3. High **Density** : Smaller chips, stacked , more data
4. High **Bandwith** : Transmitting more data at once
5. High **Latency** : Transmitting with no delay



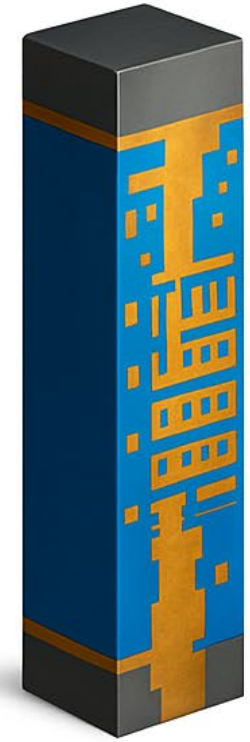
Source AMAT Investors meeting, Nov 2024

It’s all about Scale ….

Taipei 101

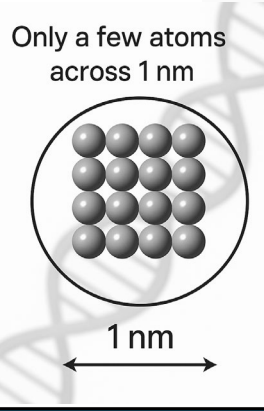
250,000,000,000
times Taller

2nm Device



Human Hair

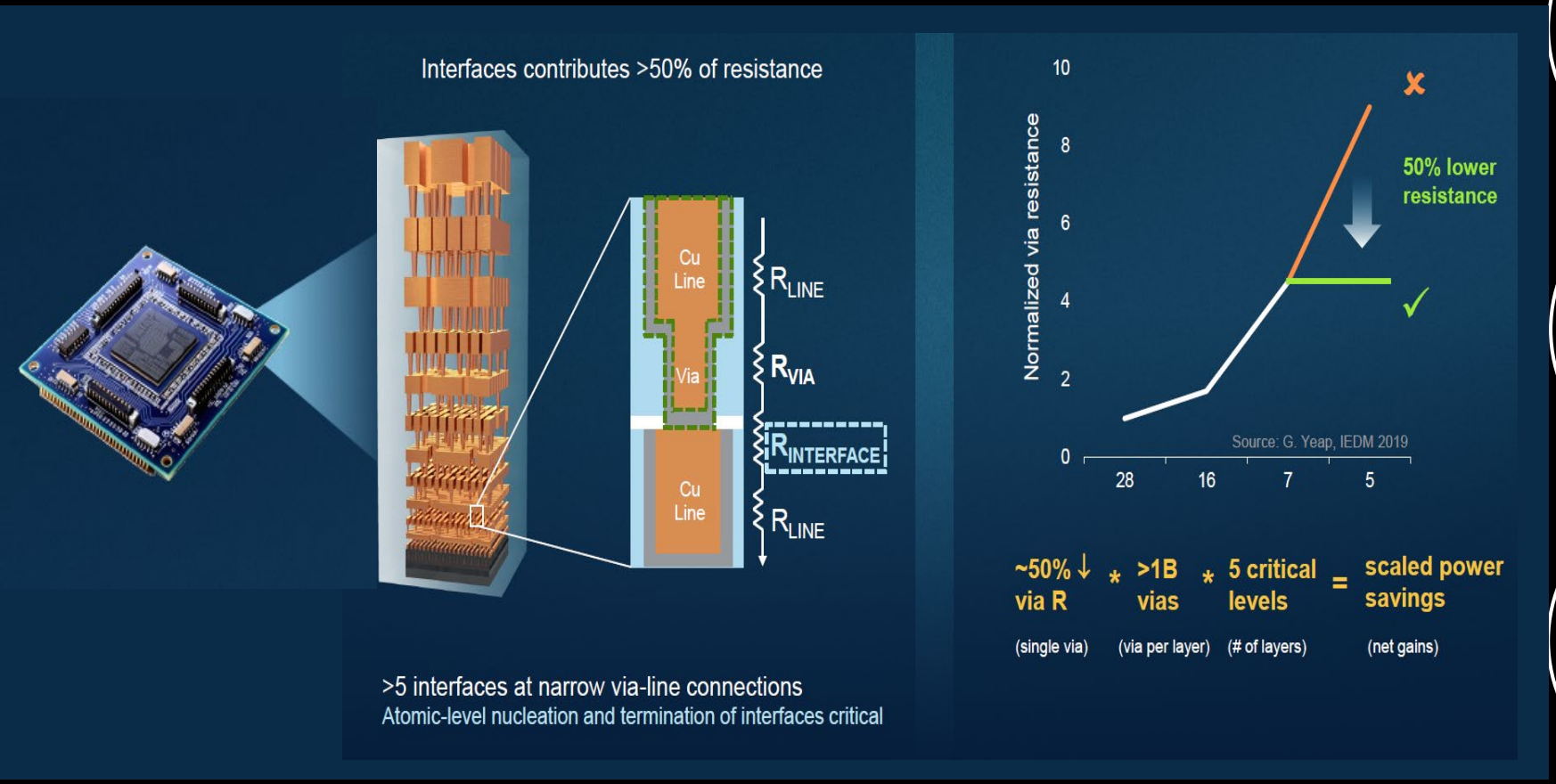
50 000
times wider



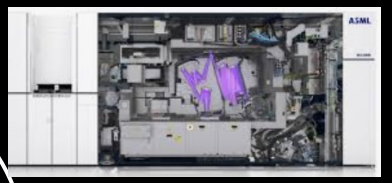
~500 meters, **500 000 000 000 nm**	> 300 Layers , **2 nm**	100 Micron, **100,000 nm**

Addressing the Interconnect Dilemma

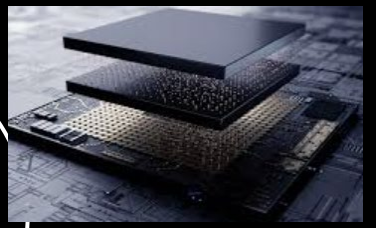
Technologies that help us stay on Moore's Law



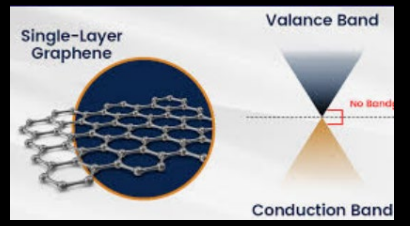
Lithography (High-NA EUV) & Splicing



Stacked Die (Adv. Pack) Adv. Chip Designs



Materials Engineering (Graphene)



What About Opportunities For Australia

From Quarry to Quantum

Australia can't compete at scale….yet
But Can compete when scale doesn't matter

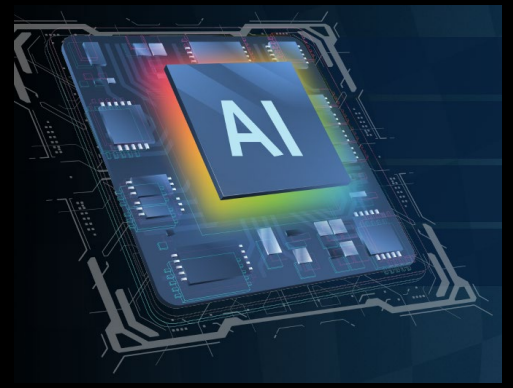
Some basic building blocs

Critical Materials
Hf, In,
SiO2, Li
…

Research
Quantum -
Photonics - RF
Pilot Programs
…

Talent Attraction
& Development
Engineering
Material science
Application
…

Semiconductor Roadmap for Australia



Australia's Semiconductor Roadmap

Critical Minerals, Resources, and Raw Materials
Lithium, Silicon, Rare Earths

Research Powerhouses
Top universities in materials science

Tech Hubs
Sydney, Melbourne, Perth research parks

Skilled Workforce
Engineering and materials science talent

R&D Ecosystem
Collaborative research centers and incubators

Government Support
Multi-year Incentives and policies to attract investment

Investment Potential

With AI courtesy

Summary

The global semiconductor value chain
— no nation does it alone, but….

Industry challenge to staying on Moore's Law
— innovation and talent attraction is key

Australia has unique strengths
— from critical minerals to research and niche design

It's time to think bold, act niche, and go global
Australia can chip in