

EE669: VLSI Technology

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Introduction to the Course

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Global market

- Global semiconductor market was 523 billion USD in 2023
 - This is ~ 0.5% of the global GDP
 - Growth of 6% per year over the last 23 years
- India import 25 billion USD worth of semiconductors currently
 - ~ 1% of GDP
 - Projected to reach 80 billion USD by 2026
- Considered a strategic sector due to the dependence of daily life on semiconductor based technologies

Ref:

* Semiconductor Industry Association (SIA) Factbook 2024

* Fortune India, April 2022

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A greater impact beyond the sales value...

The Economist Menu Weekly edition Search

Business | Pinned by chips

Semiconductors pose an unwelcome roadblock for carmakers

Rethinking supply chains for the electric era



Aug 3rd 2021

JULY 2022



Maruti Suzuki produced 51,000 fewer cars in June quarter

Pending customer orders stood at about 280,000 vehicles at the end of the June quart...

JANUARY 2022



Tesla forecasts 50% growth but chip shortage will hurt deliveries in 2022

The semiconductor crisis seems to finally catching up with the world's most valuable au...

www.fortuneindia.com

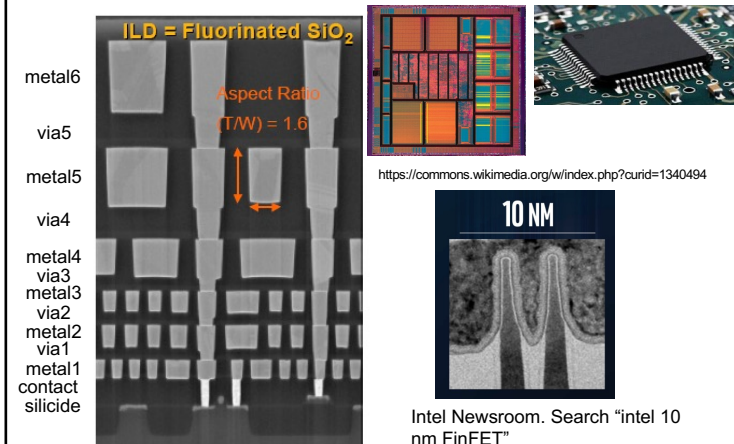
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It is good to have a picture behind the word



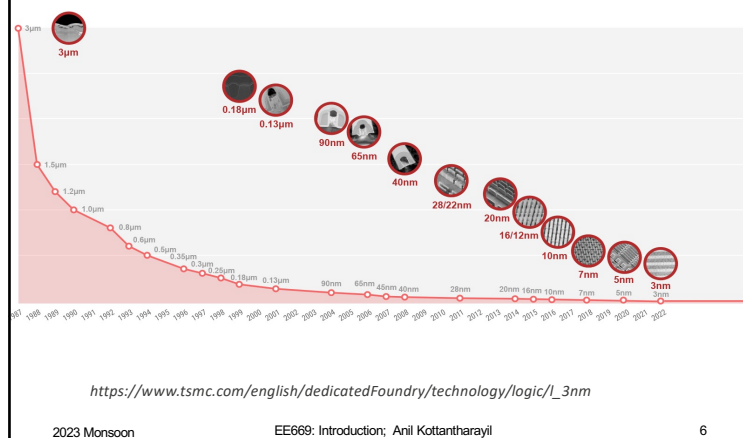
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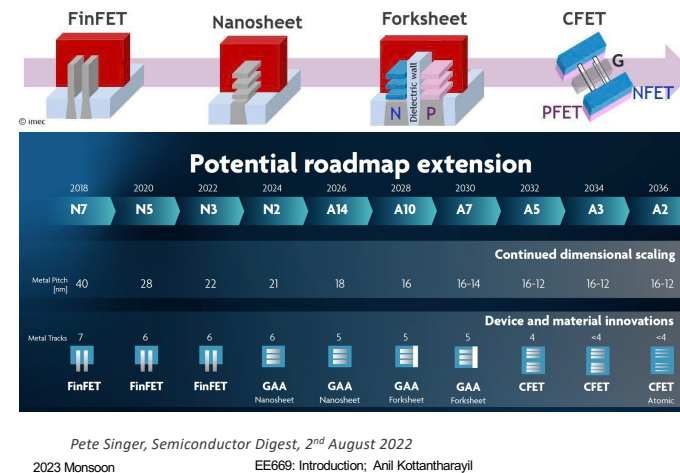
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Technology evolution



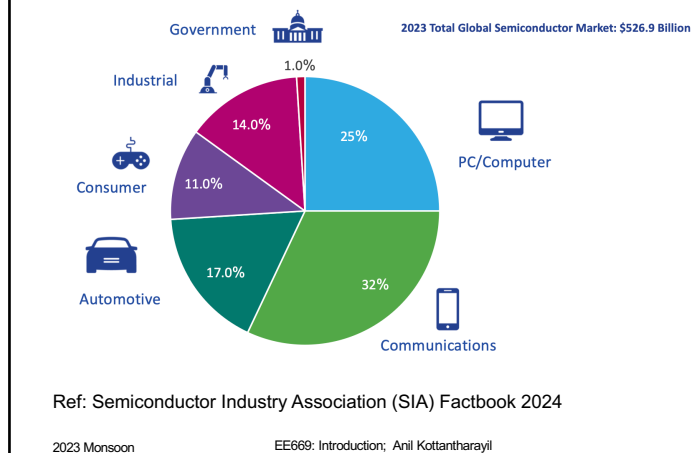
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Device Designs and Roadmap



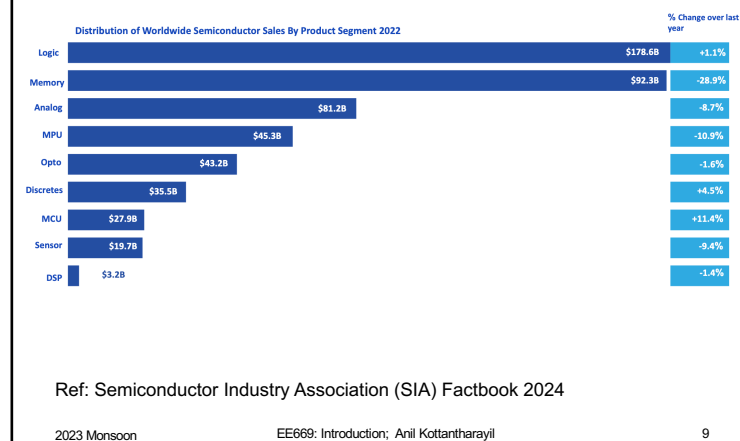
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Various end uses of chips



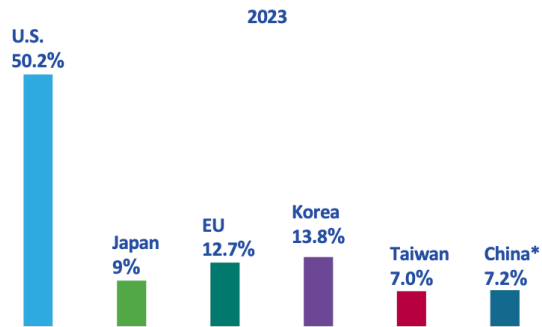
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Various IC product segments



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Who designs/makes/sells them?



Ref: Semiconductor Industry Association (SIA) Factbook 2024

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Chips with the largest number of transistors

Application	Model	Make	Billion transistors	Comments
MPU	M2 Ultra	Apple	134	Dual die in package
GPU	MI300X	AMD	153	
Deep Learning Processor	Colossus Mk2 GC200	Graphicore	59.4	
AI engine	WSE-2	Cerebras Systems	2600	wafer scale
Flash memory	V-NAND	Micron	5300	16 dies

Ref: Compiled from various wikipedia pages

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In summary

- Global semiconductor market is currently 526.9 billion USD
 - This is 0.6% of the global GDP
- United States of America dominates the world market
- India with ~ 18.5% of the world's population do not seems to have much of a heft except as a consumer

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But....

Application	Model	Make	Billion transistors	Made by
MPU	M2 Ultra	Apple	134	TSMC
AMD	MI300X	AMD	153	TSMC
Deep Learning Processor	Colossus Mk2 GC200	Graphicore	59.4	TSMC
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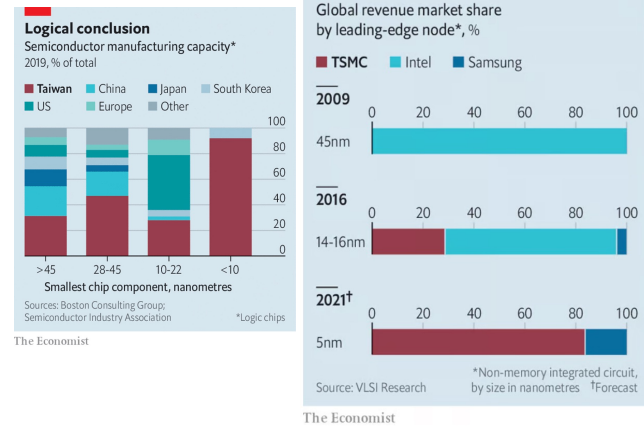
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It wasn't so.....



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Geopolitics of chips



Xi Jinping insists China will achieve 'reunification' with Taiwan - *The Guardian*, October 2021

Mark Liu, chairman of Taiwan Semiconductor Manufacturing Company, has said that his firm is the **silicon shield** preventing Taiwan from an attack by mainland China. This view is widely shared by the Taiwanese public. Su Tseng-chang, the prime minister, thinks that "as long as the world needs Taiwan, the island will be safe." – quoted from *The Economist*

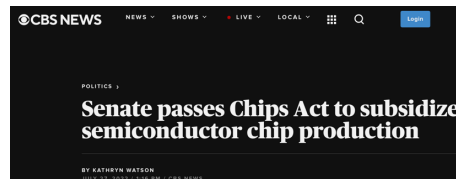
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The response



The European Chips Act: A Strategy to Expand Semiconductor Production Resiliency

March 7, 2022

By: Jillian Cota

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For India ...

- India with ~ 18.5% of the world's population do not seems to have much of heft except as a consumer
- High tech chip production can bring in a paradigm shift in our manufacturing prowess
- Geopolitical risks
- Central and State Governments have announced several incentives for semiconductor manufacturing
 - Tata, Micron, CG Power – Renesas, ?
- Increasing interest in higher education institutes

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