

# Chipset Data

(GPU Focus)

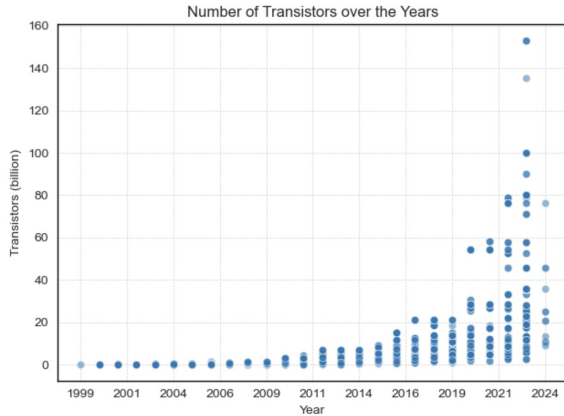
# Key Questions to Answer

1. Is Moore's Law continuing?
2. How do GPUs differ from CPUs?
3. How each vendor performs?
4. How each Foundry performs?

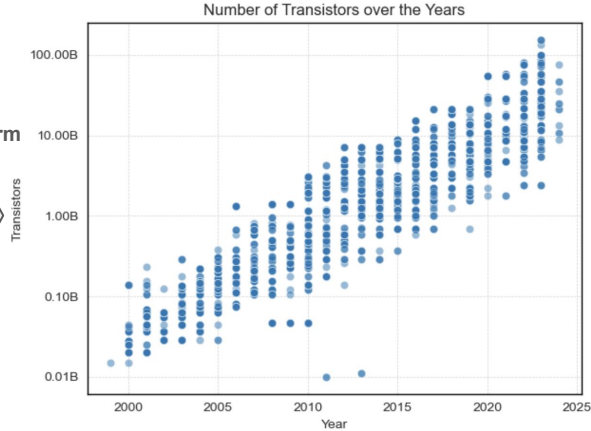
# Moore's Law

Dead or Alive

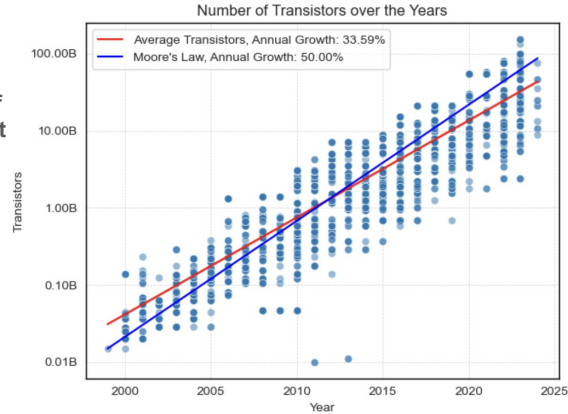
# Moore's Law - Dead or Alive?



Log Transform



Line of Best Fit



**Moore's Law:** Transistors on a chip will grow by 50% Annually (double every 2 years)

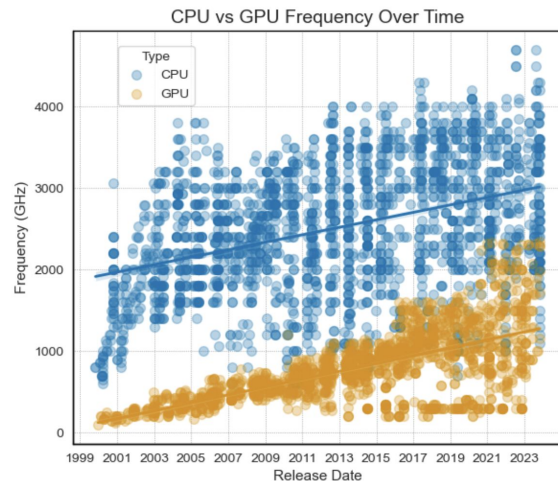
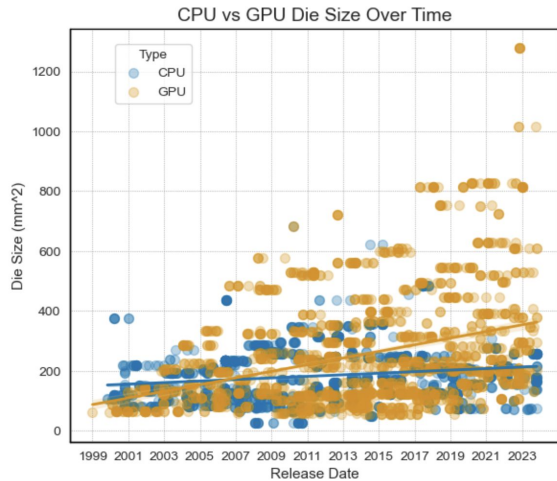
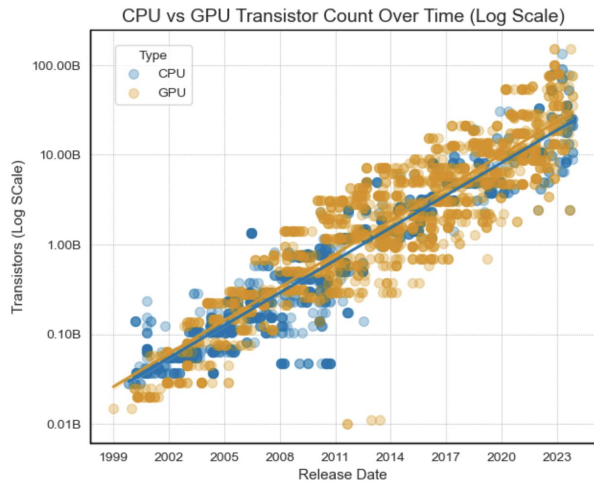
**Reality:** Annual growth of 33%

**Conclusion:** Exponential growth continues (double every 3 years) but may be slowing

# GPUs vs CPUs

What's in the pudding

# CPU vs GPU



**Transistor Count:** CPUs and GPUs have similar transistor count on a given chip

**Die Size:** GPUs have been getting bigger (more cores) while CPU chip size not really changing

**Frequency:** CPUs operate at a much higher frequency (Clock Speed) than GPUs → But GPUs are gaining!

# GPU Performance

What's in the pudding

# GPU Performance - Floating Point 32 bit GFLOPS

**Definition:** FP32 GFLOPS (Floating Point Operations Per Second) measures the performance of a GPU in performing 32-bit floating point arithmetic operations, reflecting its capability to handle complex computations.

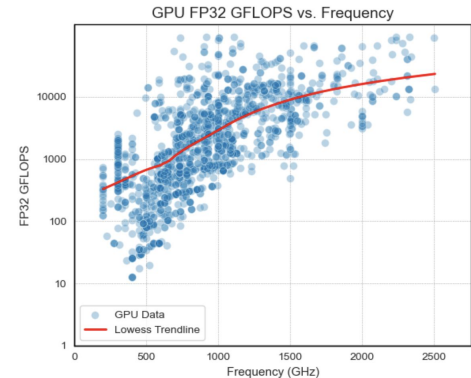
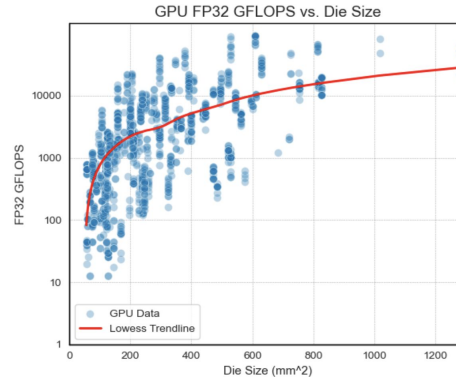
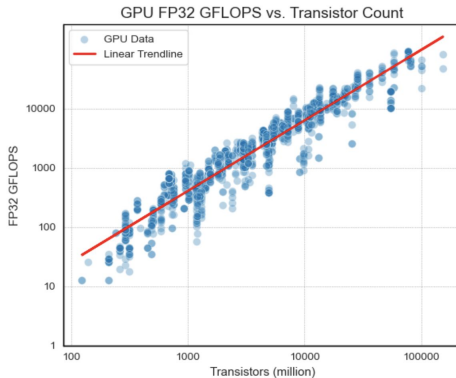
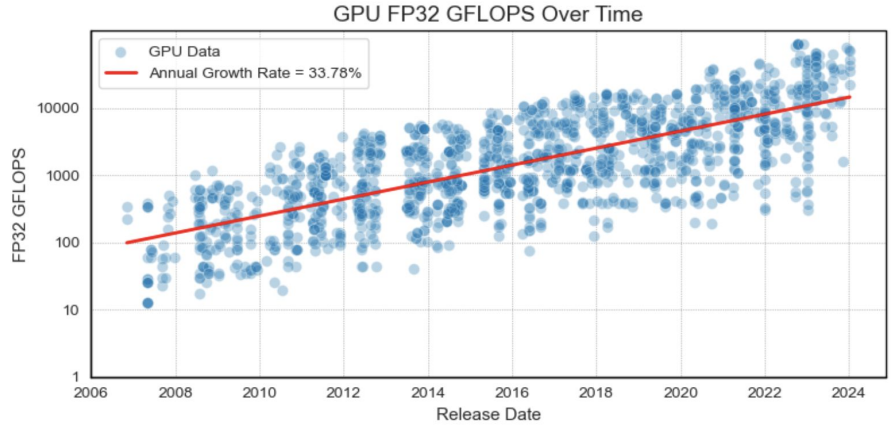
## **Key Takeaways:**

**Change over Time:** Annual 33.78% increase

**Transistor Count:** FLOPS linearly related to transistor count

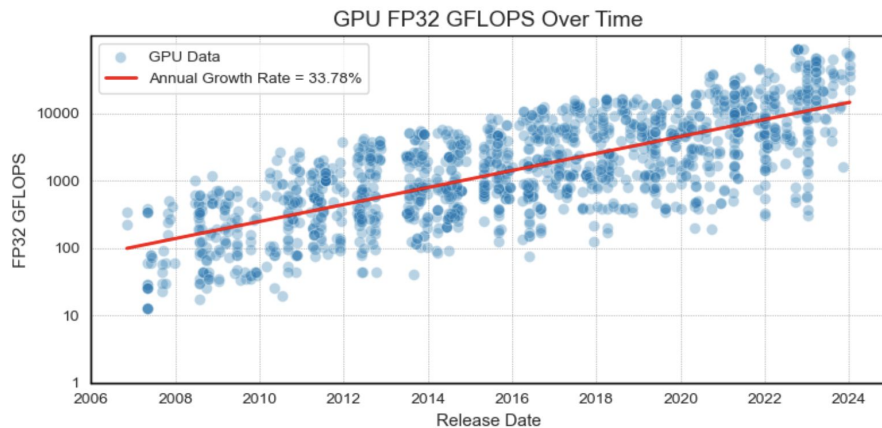
**Die Size:** FLOPS related to die size, but diminishing benefits

**Frequency:** FLOPS related to Frequency, but diminishing benefits





# GPU Performance - Floating Point 32 bit GFLOPS

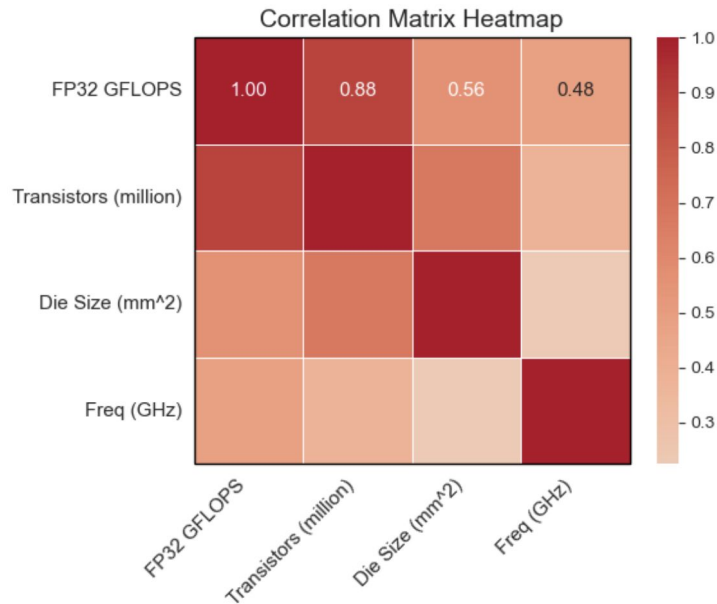


## Correlations:

FLOPS with Transistors = 0.88

FLOPS with Die Size = 0.56

FLOPS with Frequency = 0.48

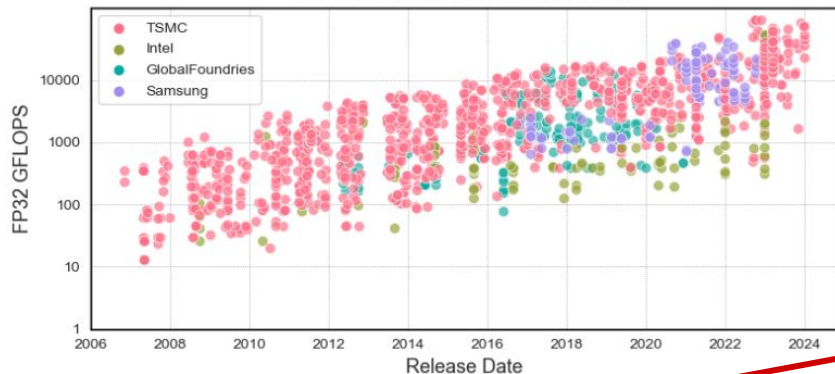


# GPU Foundry's

(Manufacturer's)

# GPU Performance vs. Manufacturer

GPU FP32 GFLOPS Over Time



## Key Takeaways

**FLOPS:** TSMC consistently makes the highest performing GPUs.

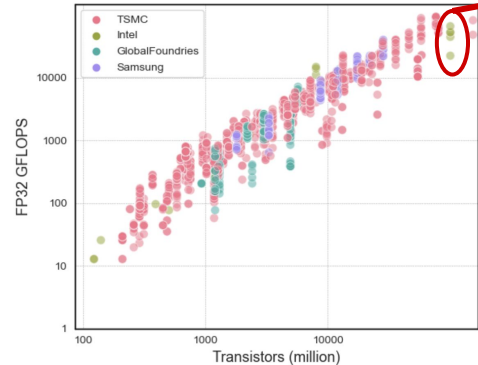
**Transistors:** TSMC consistently makes the most amount of transistors

**Die Size:** Intel has the biggest die (interesting)

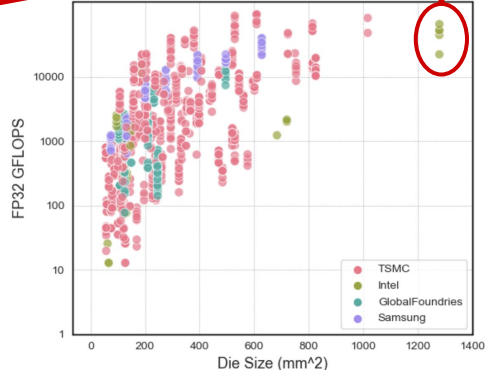
**Frequency:** TSMC makes the chips with the highest clock speed

Looks like Intel made a huge chip in  
order to have high performance

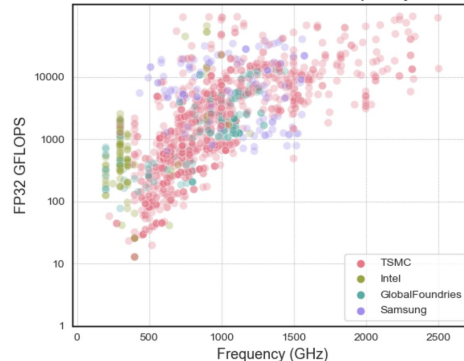
GPU FP32 GFLOPS vs. Transistors



GPU FP32 GFLOPS vs. Die Size



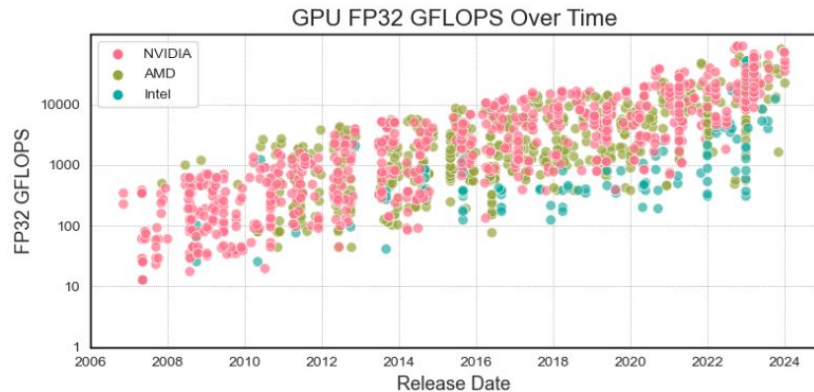
GPU FP32 GFLOPS vs. Frequency



# GPU Vendors

(Chip Designers)

# GPU Performance vs. Vendor



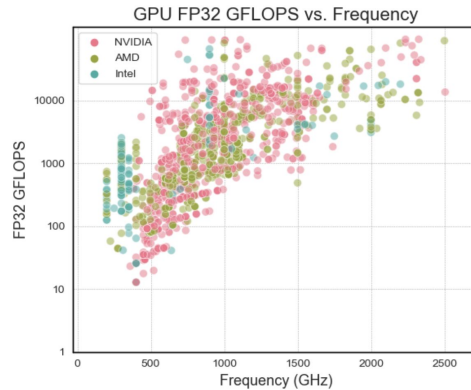
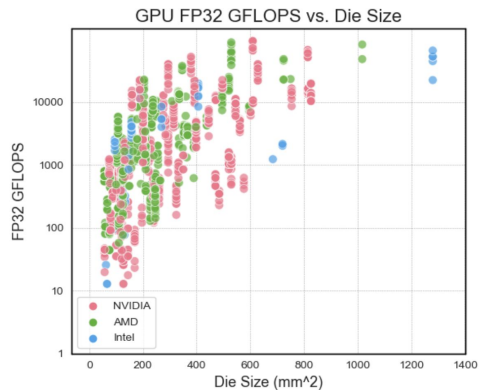
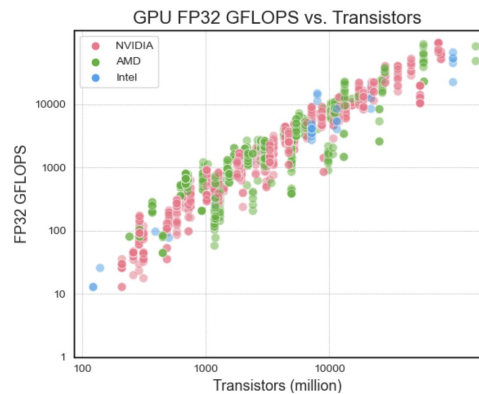
## Key Takeaways

**FLOPS:** NVIDIA and AMD appear neck and neck, Intel lagging

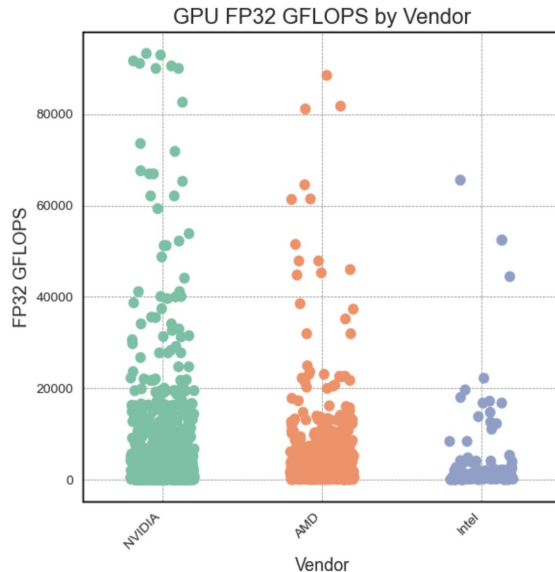
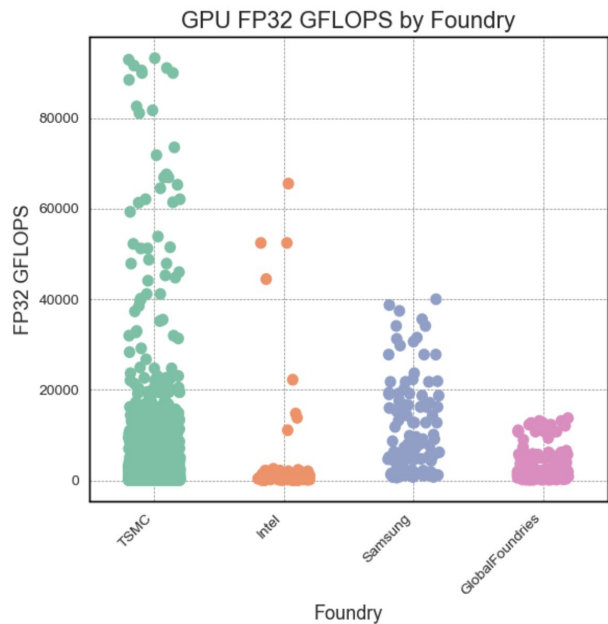
**Transistors:** No clear distinctions

**Die Size:** No clear distinctions

**Frequency:** No clear distinctions



# GPU Performance vs. Vendor



## Foundry Key Takeaways

- TSMC produces the highest performing chips
- Samsung produces a variety of high quality chips

## Vendor Key Takeaways

- NVIDIA has an advantage over AMD
- Both NVIDIA and AMD have significant advantages over Intel

# Take Home Points

(Conclusions)

# Take Home Points

- Exponential growth of transistors on CPU and GPU chips continues (33% annual growth)
- GPU performance highly correlated with Transistor count, but also Die Size and Clock Speed (frequency)
- TSMC dominates GPU manufacturing
- NVIDIA has the lead over AMD in GPU design

