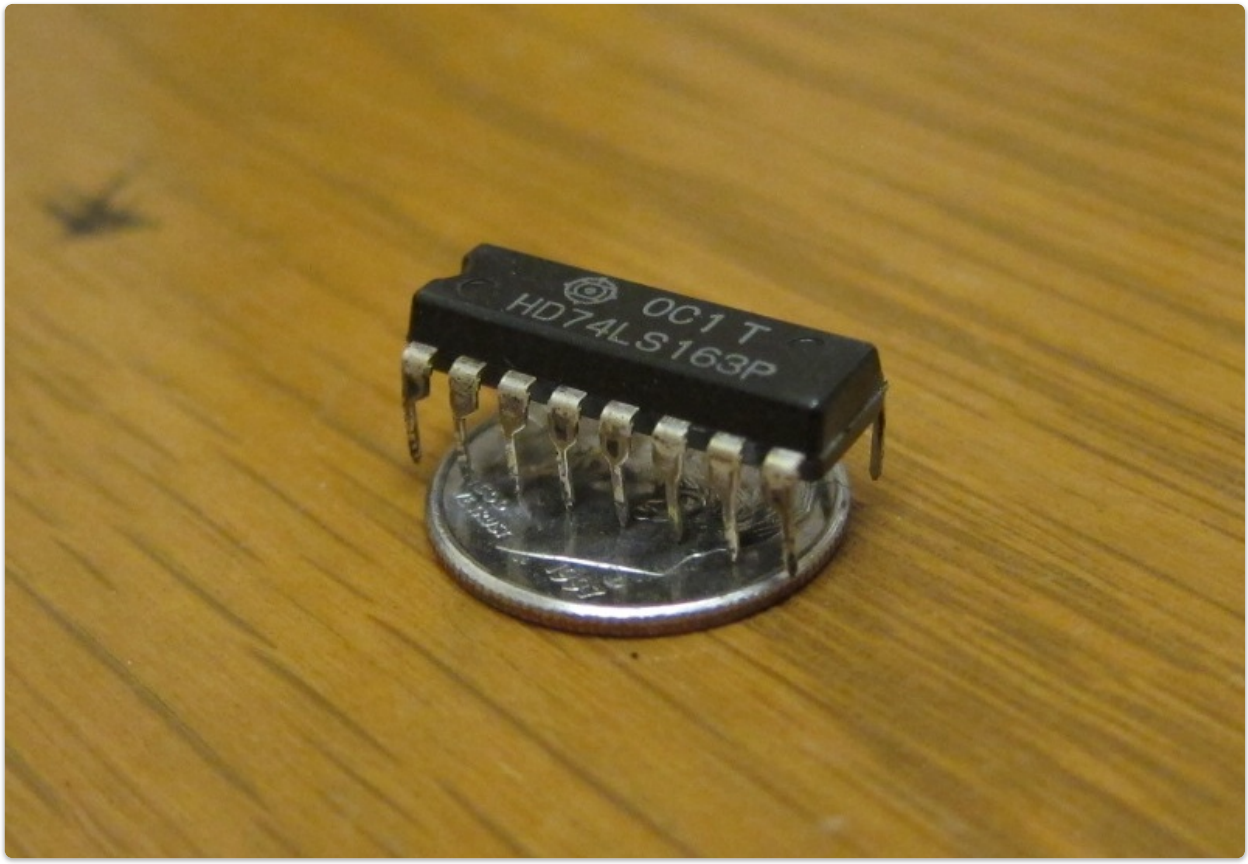
6. Computer Hardware

Computer Hardware (stanford.edu)

Chips and Transistors

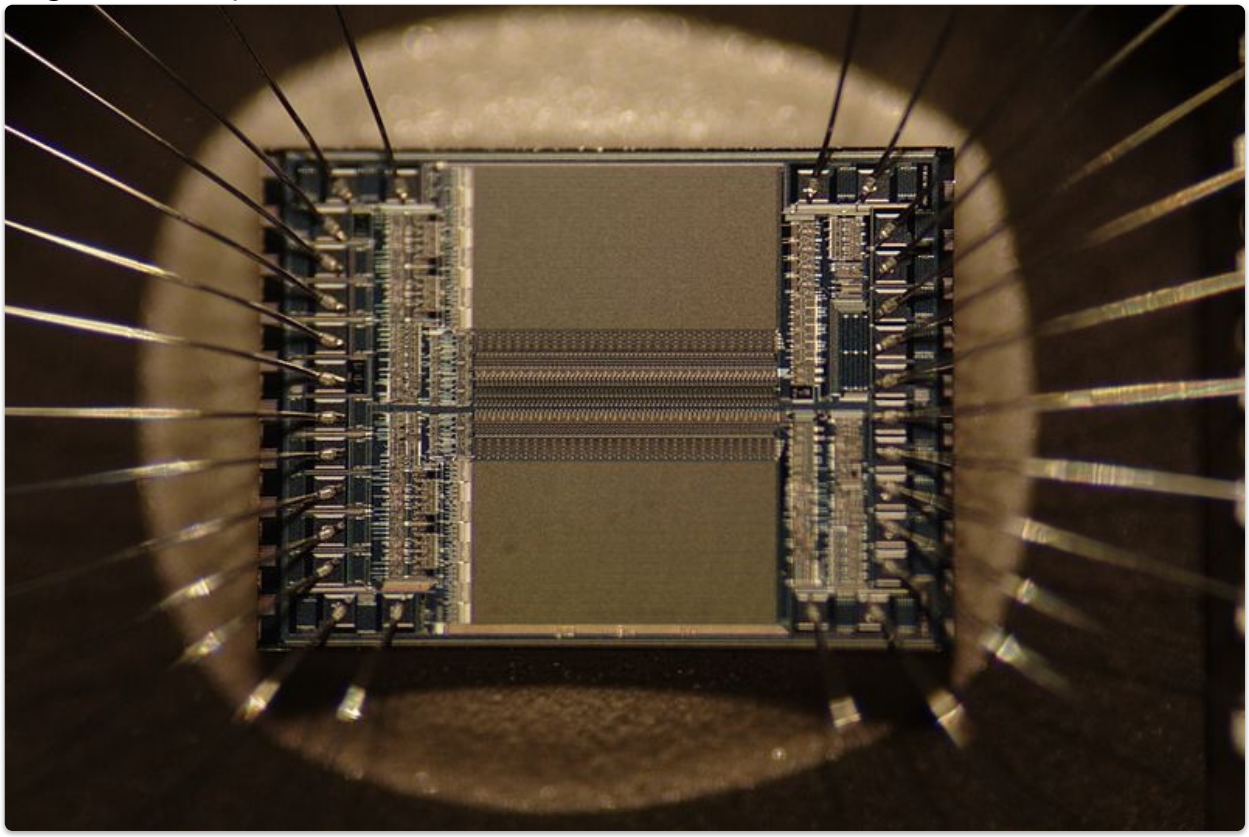
Transistor

- "Solid State", no moving parts
- "Switch" that we can turn on/off with an electric signal



Silicon Chip

- Fingernail sized piece of silicon



Microscopic Transistors

- Etched onto silicon Chips

Other Notes

- Chips contain billions of Transistors
- Chips are packaged in plastic with little metal legs
- Chips are either made in silicon (metalloid) or Silicone (soft substance on cooking utensils)

Examples of Chips & Transistors

- CPU Chips
- Memory Chips
- Flash Chips

Moore's Law

Moore's law states that transistors get 2x smaller about every 2 years due to better chip etching technology. It is theorised that Moore's law will probably not go on forever.

Effects

- *Chips have the twice the capacity every 2 years*

    - Speed does not double, capacity doubles which is still very useful
- *Or keeping capacity constant, chips get smaller and cheaper every 2 years*
    - This is how computers are now in chars, thermostats, and greeting cards
    - For example: $50 MP3 player capacity every 2 years becomes 2gb, 4gb, 8gb, 16gb,...
- **The rule of thumb is that capacity increase 8x every 6 years**

CPU

> *CPU means Central Processing Unit*

CPUs act like a brain that follows instructions in the code.

- Images, networking, math, etc all are computed by the CPU
- The term "Gigahertz" (1Ghz) = 1 billion operations per second
- 2Ghz = 2 billion operations per second

GPU

> *GPU means Graphics Processing Unit*

GPUs are like CPUs but specialized to handle images

- Most games use the GPU heavily

RAM

> *RAM means Random Access Memory*

- Temporary, working storage bytes
- Stores both coded and data temporarily
- Not persistent, meaning if the power turns off the data won't be there anymore when you turn it on

Persistent Storage

> *Hard Drive, Flash Drive*

Persistent storage means data is preserved even when the computer isn't powered.

- Hard Drive stores bytes as a magnetic pattern on a spinning disk

Flash Drives

> *Flash Drives is a transistor-like persistent storage technology*

- Better because it is faster, more reliable, and less power required
- More expensive per byte
- Examples: Flash Drive, Flash memory, SSD, SD Card, USB

File System

> *File systems organize bytes of persistent storage, files, and folders*

- A "file" has a name, and a handle to a block of bytes
- E.g "flowers.jpg" refers to 48KB of image data bytes