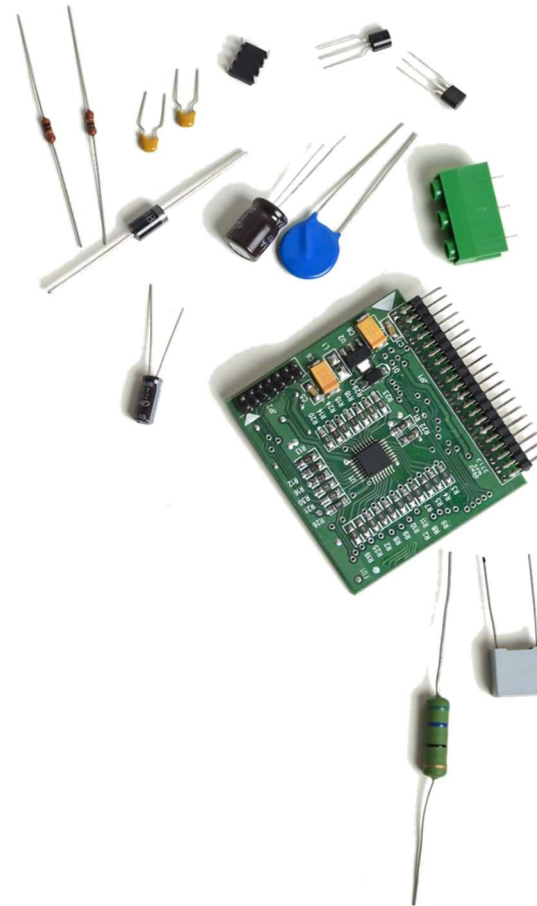


104010 : BASIC ELECTRONICS ENGINEERING

UNIT I Introduction to Electronics

(Images taken from the internet)

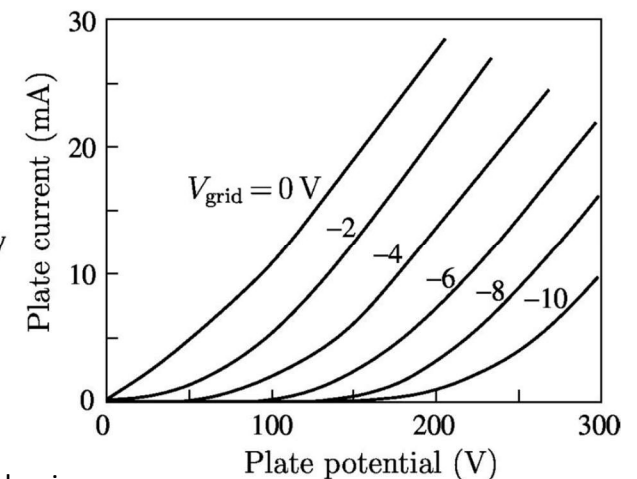
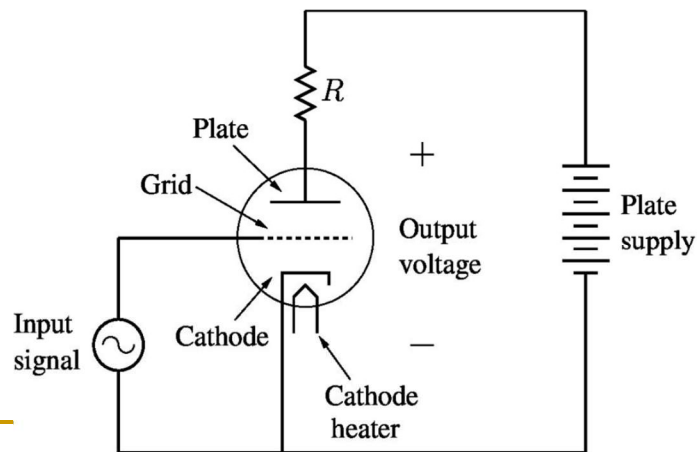
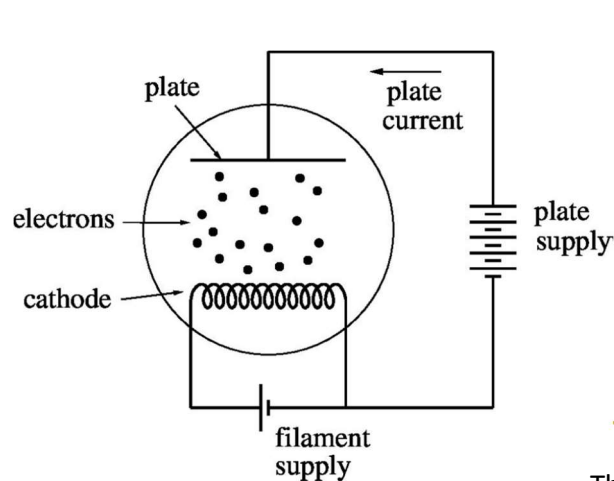


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First Generation Electronic Vacuum Tubes

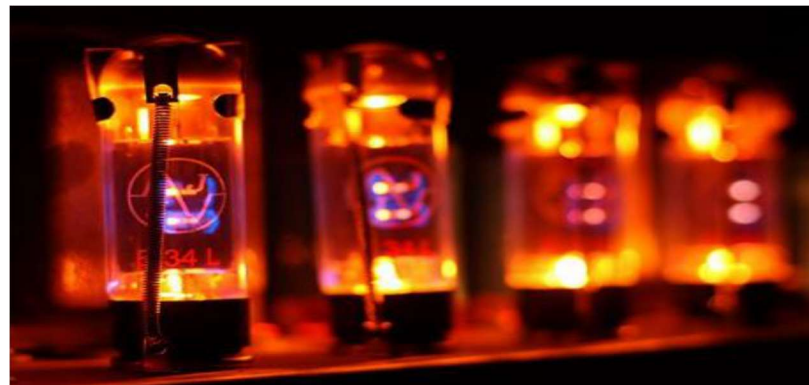
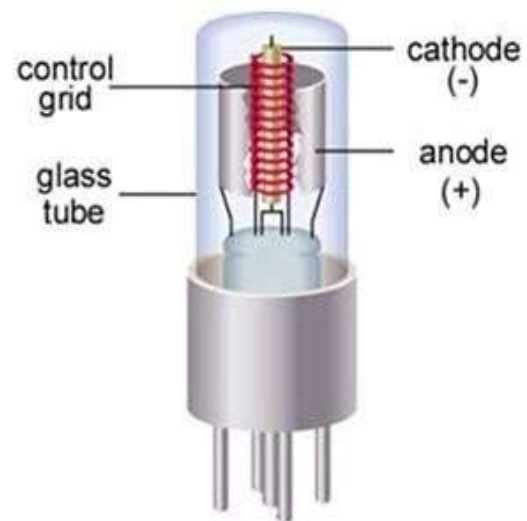
■ Vacuum tubes

- ❖ 1904: the simplest vacuum tube – the diode – was invented by John Fleming
- ❖ 1907: De Forest invented the triode by inserting a third electrode between cathode and anode.
- ❖ Applications: Switch, Amplifier, Radio, Radar, Television, early Computers



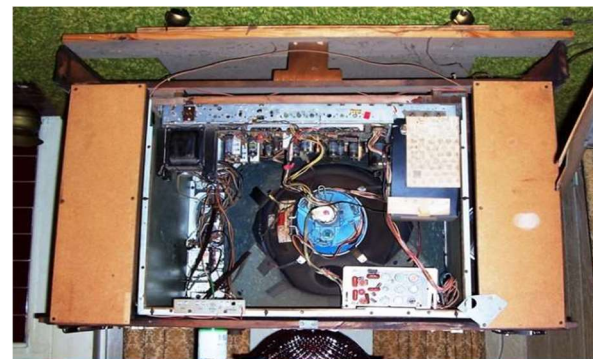
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Vacuum Tubes



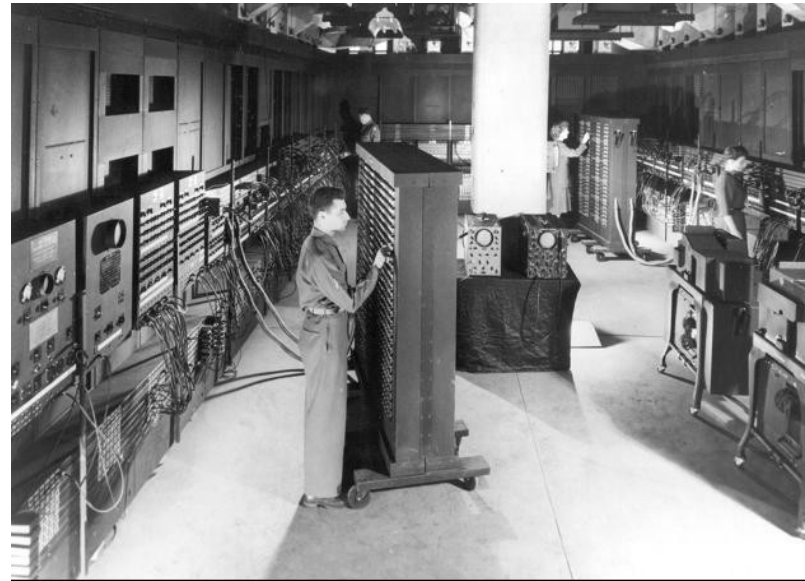
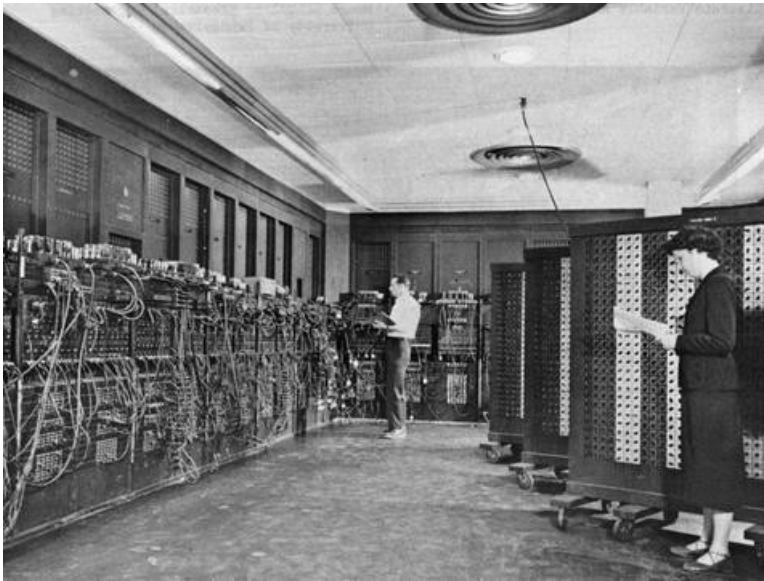
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Vacuum Tube Radio and TV



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ENIAC Computer



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Vacuum Tube Computer

- ENIAC was completed in 1945 and first put to work for practical purposes on December 10, 1945
 - ❖ ENIAC was formally dedicated at the [University of Pennsylvania](#) on February 15, 1946
 - ❖ Heralded as "Giant Brain" by the press
 - ❖ 17,468 vacuum tubes, 7200 crystal diodes, 1,500 relays, 70,000 resistors, 10,000 capacitors, 6,000 manual switches, and approximately 5,000,000 hand-soldered joints, consumed 150 kW
 - ❖ Input was possible from an IBM card reader, 100 kHz clock
 - ❖ Several tubes burned out almost every day, leaving it non-functional about half the time

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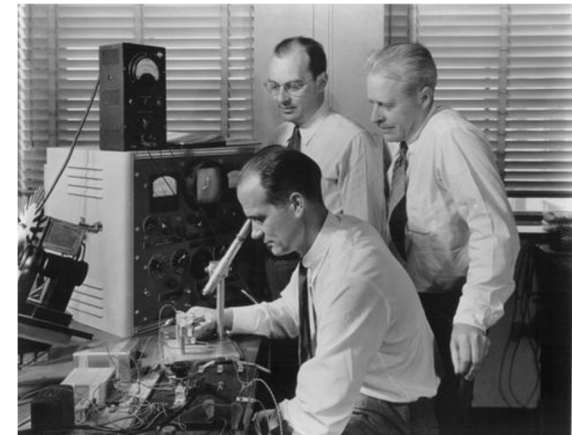
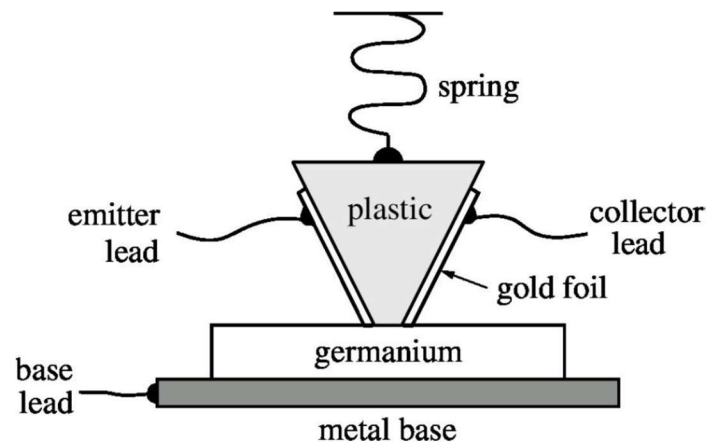
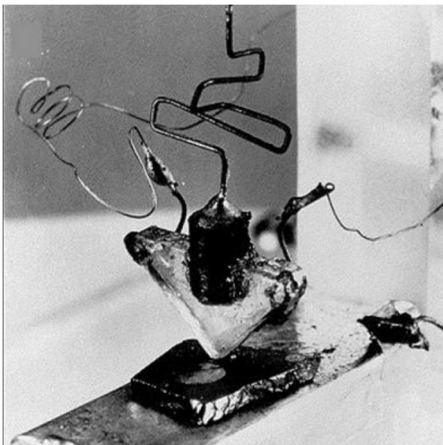
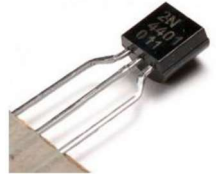
Tubes: Limitations

- Large size
- Power dissipation
- Time of operation
- Poor response
- Cost...

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The First Transistor

- ❖ The vacuum tube was a bulky and fragile device which consumed a significant power.
- ❖ 1947: Shockley, Bardeen, and Brattain at Bell Labs invented the first transistor.
- ❖ The first transistor was a “point contact transistor.” The modern transistor is a junction transistor, and it is monolithic (in the same semiconductor piece).



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Semiconductor Technology

- ❖ The bipolar transistor continues to be an important device both as a discrete device and as part of Integrated Circuits (IC).
- ❖ However, in digital circuits such as processors and memory, the MOS (Metal Oxide Semiconductor) field-effect transistor has surpassed the bipolar transistor because of the high integration density and low power consumption it offers.
- ❖ 1930: patent filed by Lilienfeld for field-effect transistor (FET).
- ❖ 1958: Jack Kilby (Texas Instruments) demonstrated the first integrated circuit (bipolar transistor, resistor, capacitor) fabricated on a single piece of germanium.
- ❖ The rest is history!

Semiconductor Solid State Devices

■ Second Generation

- Diode(1874)
 - German physicist [Ferdinand Braun](#) in 1874
- Transistor(1947)
 - 1947: Shockley, Bardeen, and Brattain at Bell Labs invented the first transistor
 - 1956 Nobel Prize
- FET
 - Austro-Hungarian physicist **Julius Edgar Lilienfeld** in 1925 and by **Oskar Heil** in 1934; could not demonstrate practical applications
 - A JFET was first patented by [Heinrich Welker](#) in 1945
- MOSFET
 - The [metal–oxide–semiconductor field-effect transistor](#) (MOSFET) was invented by Mohamed Atalla and Dawon Kahng in 1959

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Semiconductor Technology

- Third Generation

- IC

- 1949: German Engineer Werner Jacobi
 - 1958: American Electrical Engineer: Jack Clair: Texas Instruments (Nobel Prize in 2000)

- Microprocessor

- 1971, 4-bit microprocessor, INTEL 4004, Ted Hoff, Federico Faggin and Busicom, Masatoshi Shima

- Microcontroller

- Computer

- Embedded Systems.....

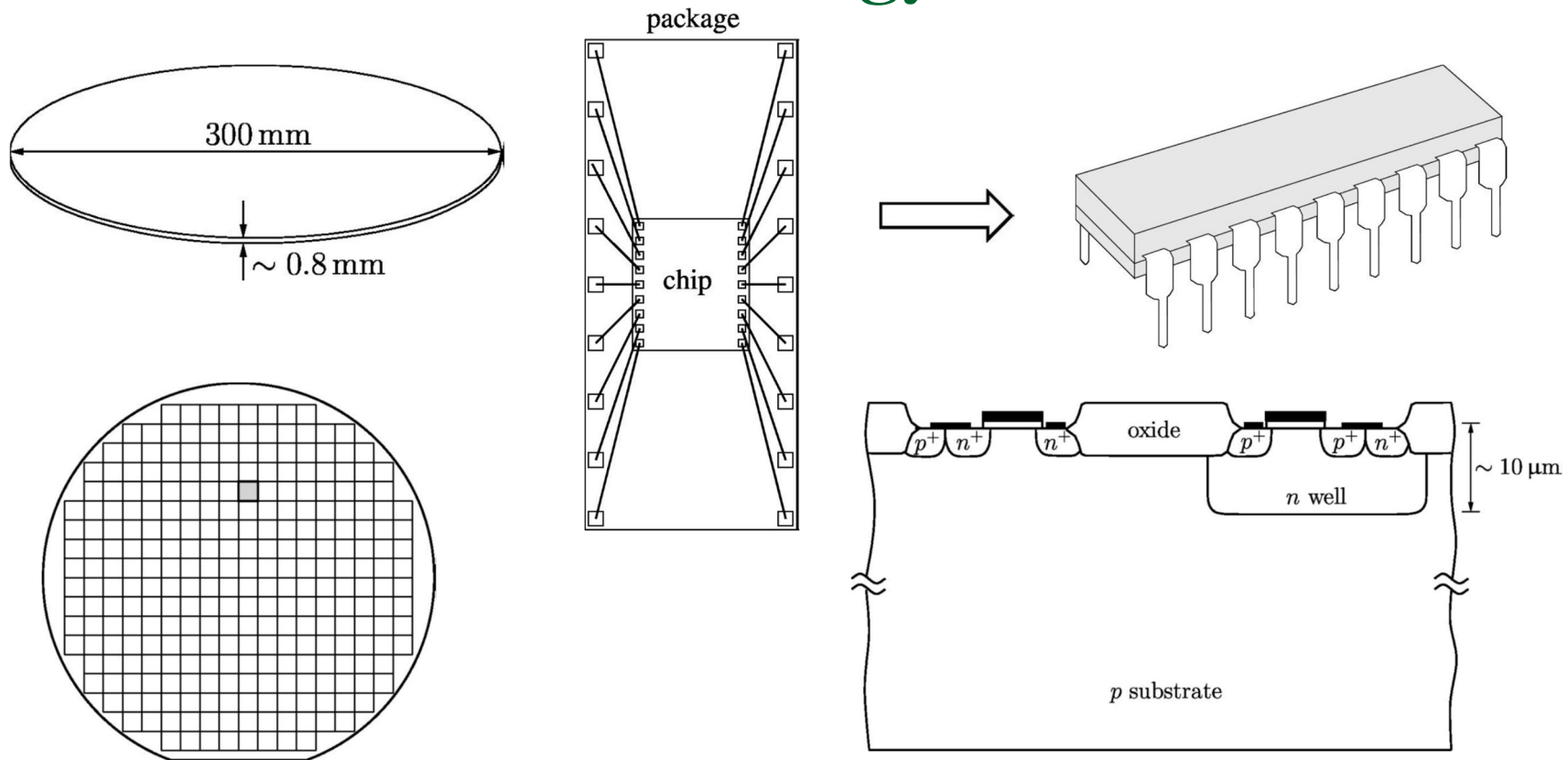
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Semiconductor Technology

- Small in Size : Billion Transistors on a chip
- Minimal Power consumption, longer battery
- Miniaturization
- Fast, Speed
- High Reliability
- Long life: Some Transistors are in working for the last 50 years

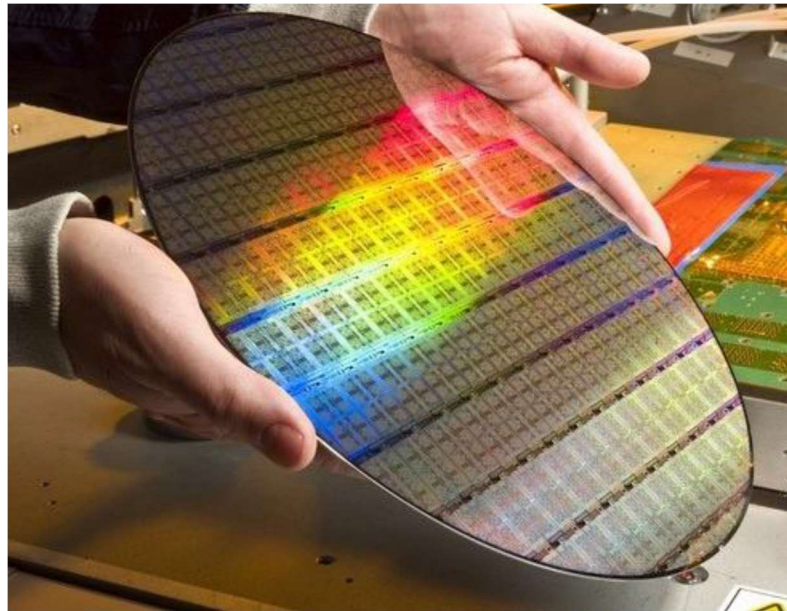
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Semiconductor Technology



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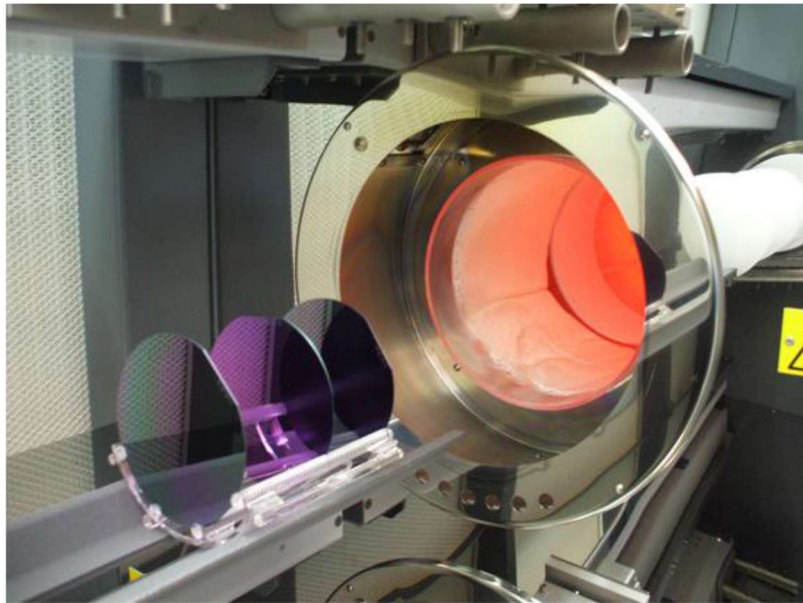
Modern Semiconductor Technology



Silicon Wafer

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Modern Semiconductor Technology



Diffusion Furnace



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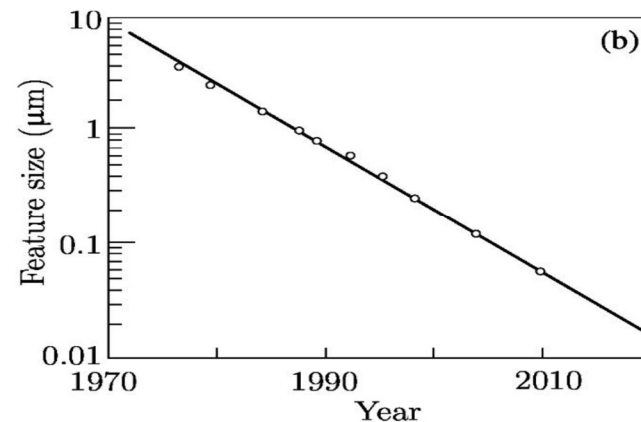
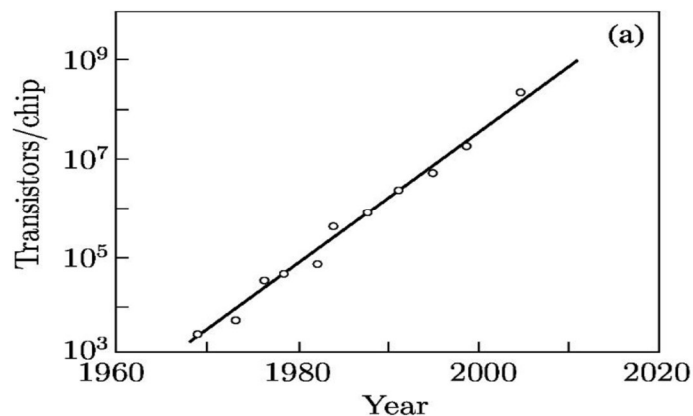
Modern Semiconductor Technology



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MOS Technology: Scaling

- Shrinking of the smallest definable dimension (“feature size”) on the chip has enabled a huge number of transistors to be integrated on one chip.
- 1970: feature size of 10 μm , 2010: 0.032 μm
- Moore’s law: a prediction by Gordon Moore (Intel founder) in 1965: number of transistors will double every two years
- Increased functionality: “system on a chip” is now possible.



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Impact of Electronics

- Electronics have become an integral part of our lives.
- Start our day with an electronic alarm to get up early in the morning, prepare food with the help of a microwave oven, use a washing machine to clean our clothes and listen to music using electronic gadgets like a CD player, DVD Player, iPod, computer, mobile etc.
- Electronics in every walk of life such as in homes, schools, colleges, defense, industries, health care, research, geographic science, graphics.
- Electronics has become the backbone of digital technology.
- The electronics industry is growing very fast and is creating good job opportunities in industries like mobile phones, IT industry, television, computers, laptops, tablets and palmtops.
- In addition to this, there are good career options in consumer durables, oil and gas, chemical and power electronics.
- It has many applications ranging from healthcare, satellite communication, mobile communication (2G, 3G, 4G), telecommunication and Internet technology

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Applications

- Consumer Electronics
- Wired and Wireless Communications
- Medical Electronics
- Optoelectronics
- Transport and Automobile
- Remote Sensing
- Defense
- Radar
- Satellite

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Radio

- Guglielmo Marconi: Italian **inventor**, proved the feasibility of **radio** communication. He sent and received his first **radio** signal in Italy in 1895.



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Television



- This device was created independently by two inventors: Scottish inventor John Logie Baird and American inventor Charles Francis Jenkins. Both devices were invented in the early 1920s.
- The world's first electronic television was created by a 21-year-old inventor named Philo Taylor Farnsworth.
- America's first commercially produced television sets were based on the mechanical television system – made by John Baird's television designs.

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Telephones



Actor portraying Alexander Graham Bell in a 1915 silent film shows Bell's first telephone transmitter (microphone), invented 1876 and first displayed at the Centennial Exposition, Philadelphia.

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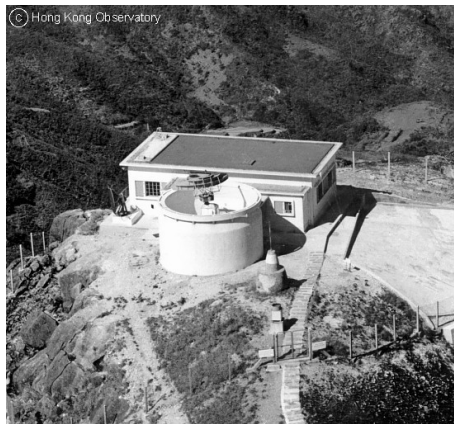
Mobile Phones



Motorola was the first company to produce a handheld mobile phone. On April 3, 1973, Martin **Cooper**, a **Motorola** researcher and executive, made the first mobile telephone call from handheld subscriber equipment, placing a call to Dr. Joel S. Engel of Bell Labs.

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Radar



















Early military radar system

The first practical **radar** system was produced in 1935 by the British physicist Sir Robert Watson-Watt, and by 1939 England had established a chain of **radar** stations along its south and east coasts to detect aggressors in the air or on the sea.

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Active and Passive Components

PASSIVE

Resistor		
LDR		
Thermistor		
Capacitor		
Inductor		
Switch		
Variable Resistor		
Transformer		

ACTIVE

Transistor  

BJT, JFET, MOSFET

Operational Amplifier  

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Difference between Active & Passive Components

- Active devices inject power to the circuit, whereas passive devices are incapable of supplying any energy.
- Active devices are capable of providing power gain, and passive devices are incapable of providing power gain.
- Active devices can control the current (energy) flow within the circuit, whereas passive device cannot control it.
- An external power is required to start basic operation of an active device where no extra power is used for passive device.

Acknowledgement

Web Resources



Thank You..

