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Core Semiconductor Technologies

1876 Telephone invented by Graham Bell
1897 Cathode ray tube invented by Karl Ferdinand Braun
1900 Two-electrode vacuum tube invented by John Fleming

Three-electrode vacuum tube invented by Lee De Forest
Television receiver with a cathode ray tube devised by Russian scientist Boris Rosing

Semiconductor prehistory: Development of electronic circuit and control technology

Demand for durable solid state devices

1940 Photovoltaic effect in silicon discovered by Russell Ohl (at Bell Labs)
P- and n-type conduction discovered by Jack Scaff
Technique to manufacture p- and n-type semiconductors by doping impurities discovered by Henry Theuerer and Jack Scaff
Point-contact transistor discovered by Walter Brattain and John Bardeen
Junction transistor theory published by William Shockley

1950 Bell Labs licenses transistor technology
Field-effect transistor theory published by William Shockley
Solar cell invented
Gas diffusion method invented by Calvin Fuller

Esaki diode invented by Leo Esaki
Demonstration of IC by Texas Instruments (TI)
Fairchild and TI announce IC

1960 Prototyping of MOSFET at Bell Labs
Planar IC patent granted

First semiconductor memory DRAM prototyped at IBM
CCD invented at Bell Labs

1970 Intel ships world's first DRAM Intel 1103 (1 kbit)
World's first microprocessor Intel 4004 announced
Intel 8080 announced
Motorola 6800 announced
Z80 announced by Masatoshi Shima

Intel 8086 (16-bit) announced

1980 Intel 80286 announced
Intel 80386 (32-bit) announced

Intel 80486 announced

1990 Intel Pentium announced
Blue LED invented by Shuji Nakamura

2000 Cell Broadband Engine announced

Into Nanotechnology Age

Research in quantum bits, quantum algorithms, and quantum optics makes progress

2014 NVIDIA GeForce GT1030 announced

D-Wave Systems delivers a quantum computer product

Method for enabling massive optical quantum computing invented by Akira Furusawa at the University of Tokyo

2017

Applied technologies

1876 1897 1900 Telegraph, telephone, wireless communication

Wireless communication technology

Vacuum tube technology

1910

Radio broadcasting
- First radio station starts broadcasting
- Radio broadcasting starts in the UK
- Radio broadcasting starts in Japan

TV broadcasting
- World's first successful reception of images using a cathode ray tube
- Successful TV transmission experiment between New York and Washington DC
- Experimental TV broadcasting starts
- Worlds' first regular TV broadcasting starts in the UK (BBC)
- NHK starts experimental TV broadcasting in Japan
- One-seg service starts in Japan
- Digital switchover of terrestrial TV in Japan
- NHK starts 4K and 8K test broadcasting

Computer
- Atanasoff–Berry computer (ABC) invented
- Bell Labs Model 1 relay computer introduced
- Codebreaking computer Colossus introduced
- World's first general-purpose computer ENIAC completed
- First commercial-use computer UNIVAC I introduced
- First transistorized computer TRADIC introduced
- Eiichi Goto at the University of Tokyo invents "parametron" logic circuit element
- First commercial-use transistor computer IBM 608 announced
- Japan's first electronic computer FUJIC introduced
- Last vacuum tube computer IBM 709 released
- IBM 7070, 7090, CDC 1604
- PDP-1 released by DEC
- PDP-5 released by DEC
- IBM System 360 announced
- PDP-11 released by DEC
- Cray-1 announced
- Earth Simulator starts operations
- K computer starts operations
- AI (artificial intelligence)
- Deep learning
- Autonomous driving becomes commercially available
- Commercial drone released

Transistor technology
- Japan's first transistor radio TR-55 released by Sony

IC technology

Electronic calculator
- First electronic calculator ANITA Mk VIII introduced
- IC-based calculator CS-31A released by Sharp
- LSI-based calculator QT-80 released by Sharp

Semiconductor memory
- Intel ships 64-bit bipolar semiconductor memory chips
- Flash memory invented by Fujio Masuoka
- Successful prototyping of 16 Mb DRAM by NTT

Microprocessor technology

Video game
- Video game Pong announced
- Video game Space Invaders announced
- Atari shock (video game crash)
- Nintendo Family Computer released
- Sega Mega Drive released
- Nintendo Game Boy released
- Nintendo Super Famicom released
- Panasonic 3DO REAL released
- Sega Saturn released
- SCE PlayStation released
- Nintendo 64 released
- SCE PlayStation 2 released
- SCE PSP released
- Nintendo DS released
- SCE PlayStation 3 released
- SCE PlayStation 4 released
- Virtual Reality (VR)
- Augmentted Reality (AR)
- Nintendo Switch released

Personal computer
- Xerox Alto completed
- Altair 8800 computer kit announced
- NEC TK-80 introduced
- Microcomputer magazine I/O inaugurated
- First West Coast Computer Faire held
- Apple II released by Apple Computer
- ASCII magazine inaugurated
- IBM PC released
- NEC PC-8801, PC-6001 announced
- IBM PC compatible computer released by Compaq
- Macintosh announced
- Windows 95 announced
- Apple releases iPad
- Personal 3D printer released

Mobile phone
- Digital mobile phone service starts
- PHS service starts
- i-mode service starts

Smartphones
- Apple announces the iPhone
- Android phones announced

Wearable devices
- Google Glass announced
- Apple: Apple Watch released

Computer technology

Internet
- ARPANET introduced
- Ethernet announced
- TRON project inaugurated by Ken Sakamura
- WWW specification released
- Mosaic browser released
- IIJ starts network connection service in Japan
- Netscape Navigator announced
- Java announced

Wireless communication
- Remote medical treatment (virtual care)
- NTT successfully conducts 5G trials in outside environment
- Four Japanese GPS Michibiki satellites become operational

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Compound semiconductor
High-k metal gate
Power semiconductor

Nanoscale processing
Quantum mechanics
New semiconductor structures
(3D NAND, FinFET)

Mobile phone
Smartphone
Wearable device

Digital entertainment
Network game

Personal computer
Tablet
Edge computing device

Next-generation supercomputer
Data center
Industrial robot

Ubiquitous network
Cloud computing
Space development