

## **Comparative Study on Different Types of Motherboards**

A **motherboard** is a critical component of a computer system, acting as the main circuit board that connects various hardware components, allowing them to communicate. It is often referred to as the mainboard, system board, or logic board. It serves as the central hub that connects and facilitates communication between various hardware components, including the CPU, RAM, storage devices, and expansion cards. Without a motherboard, the individual components of a computer cannot interact effectively. The design and specifications of motherboards have evolved significantly since their inception, accommodating advances in technology and user needs.

---



***IBM Engineer Patty McHugh***

The concept of the motherboard evolved from earlier technology known as the backplane, which was simply a circuit board that connected various components without integrating them. The first motherboard as we know it today was introduced by IBM in 1981 with the **Planar Breadboard**, designed by engineer **Patty McHugh**. This board housed essential components like the CPU and RAM, marking a significant milestone in computer architecture.

---

## **History of Motherboards**

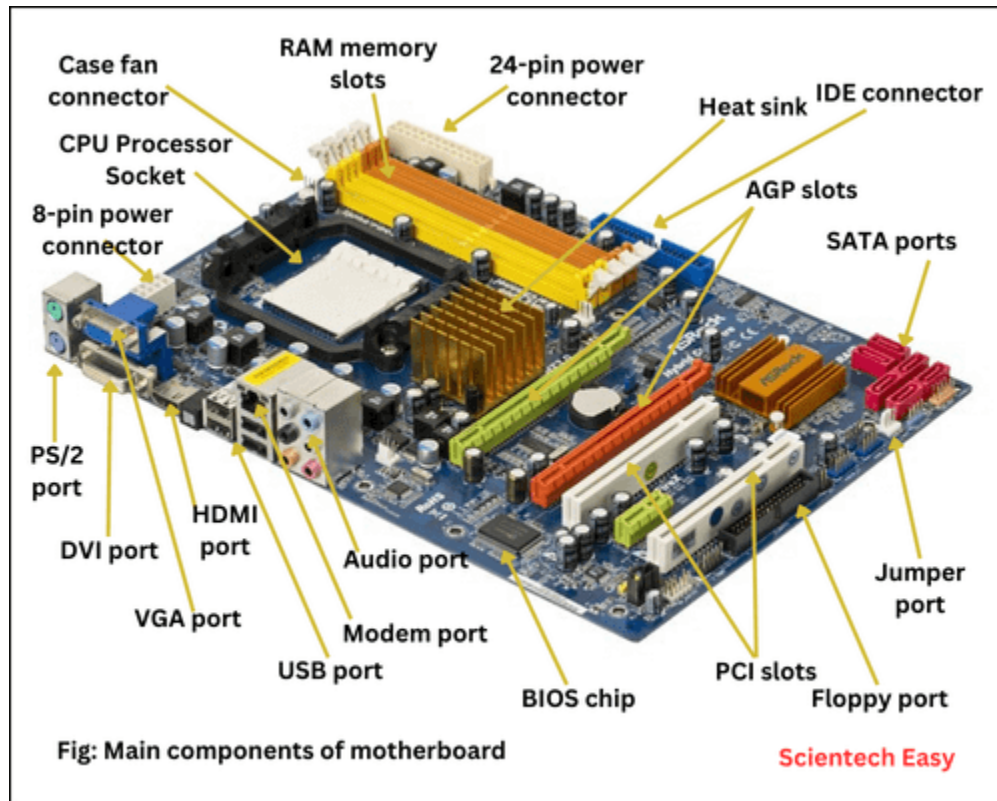
- **1970s-1980s:** The concept of a motherboard began to take shape with early PCs, like the Apple II in 1977, which used single, large circuit boards to mount processors, memory, and other components. IBM's 1981 PC introduced the term "motherboard" more formally, featuring an open architecture that allowed for expansion cards and peripherals.
  - 1981: Introduction of the Planar Breadboard in IBM's first personal computer.
  - 1984: Release of the Advanced Technology (AT) motherboard, which set a standard for future designs.
  - 1985: Introduction of the Baby AT motherboard, which was smaller and more compatible with various PC cases.
- **1990s:** As personal computers became more mainstream, motherboard designs became standardized, with AT (Advanced Technology) being an early form factor. Later, the ATX (Advanced Technology eXtended) form factor emerged, which became a widespread standard and introduced better layout designs, cooling, and ease of expansion.
  - 1995: Development of the ATX form factor by Intel, which improved layout and airflow and became the most widely adopted standard

- **2000s-Present:** Since the 2000s, motherboards have evolved to support more advanced CPUs, GPUs, and connectivity options like USB, SATA, and PCIe. They also began to incorporate features for overclocking, RGB lighting, and Wi-Fi connectivity, catering to gaming and enthusiast communities.

---

## Uses of Motherboards

- **Personal Computers**
  - They form the backbone of desktops and laptops, allowing users to build and upgrade systems for everyday tasks, gaming, and professional applications.
- **Servers**
  - High-end motherboards are used in server systems, designed to handle large data volumes, process multiple tasks simultaneously, and ensure maximum uptime and reliability.
- **Embedded Systems**
  - In devices like smart TVs, IoT devices, and industrial machines, smaller form-factor motherboards power the essential functions of these systems.
- **Mobile Devices**
  - Motherboards in smartphones and tablets, sometimes called logic boards, contain the CPU, memory, storage, and other components in compact configurations.



## Main Components on a Motherboard

- **CPU Socket**
  - Holds the CPU, which executes instructions. Different sockets support different types of CPUs (e.g., Intel's LGA or AMD's AM sockets).
- **Chipset**
  - The set of controllers that manage data flow between the CPU, RAM, and peripherals. Divided into northbridge (now integrated into CPUs in modern boards) and southbridge (handles slower components).

- **RAM Slots**
  - Connect the motherboard to memory sticks for temporary data storage.
- **PCIe Slots**
  - Provide connectivity for expansion cards, such as GPUs, sound cards, and network adapters.
- **Storage Connectors**
  - SATA ports for connecting hard drives and SSDs, and newer boards also have M.2 slots for faster NVMe SSDs.
- **Power Connectors**
  - Connect the power supply unit (PSU) to distribute electricity to various components.
- **USB Headers**
  - Provide connections for USB ports on the front or top of a PC case.
- **BIOS/UEFI Chip**
  - Contains firmware that initializes hardware at startup and provides a low-level interface for system settings.
- **I/O Ports**
  - Located at the back panel for connecting external devices, including USB, HDMI, audio, Ethernet, and more.

Slots						Ports / Slots		
Form Factor	Build	CPU	Memory	Chipsets	BIOS	PCI/e	SATA	Builtin Features
AT Motherboard	12 in x 13.8 in	1	4	Intel 80286, 80386, 80486	Older BIOS types	5	Not supported	Basic Functionality
ATX Motherboard	12 in x 9.6 in	1	2-8	Intel Pentium - Z-series and H-series, AMD X/B-series	UEFI support	4-7	4-12	Extensive IO
BTX Motherboard	12.8 in x 10.5 in	1	2-4	Intel Pentium 4, 915 and 945 series.	Similar to ATX	Up to 7	Supported in newer models	Enhanced thermal management design
Extended-ATX Motherboard	12 in x 13 in	Up to 2	2-8	Intel's X299, Z-series, AMD X570, TRX40	UEFI support	Up to 8	> than standard ATX	High-performance and multi-GPU
LPX Motherboard	Typically 9 in x 13 in	1	2-4	Intel Pentium Chipsets	Older BIOS types	< 4	Rarely supported	Compact Systems
Micro-ATX Motherboard	9.6 in x 9.6 in	1	2-4	Intel B- and H-series, AMD A- and B-series	UEFI in newer models	4	4-8	Compact yet versatile; budget builds

<b>Mini ITX Motherboard</b>	6.7 in x 6.7 in	1	2	Intel Z, B, H-series, AMD B- and A- series	UEFI in newer models	1	2-6	Small form factor PCs
<b>Mini-ATX Motherboard</b>	5.9 in x 5.9 in	1	2-4	Similar to micro-ATX chipsets	Often has UEFI firmware	2-4	4-8	May include graphics outputs, ethernet and Wi-Fi
<b>Pico BTX Motherboard</b>	8 in x 10.5 in	1	Up to 2	Intel 915, 945 and other Pentium-era chipsets.	Older BIOS types	1-2	2-4	May include basic I/O ports but lack advanced features
<b>Standard-ATX Motherboard</b>	12 in x 9.6 in	1 to 2 (high end)	4-8	From early Intel Pentium - latest Intel and AMD chipsets	UEFI support	4-7	4-12	Advanced I/O options such as USB ports (USB-A, C), integrated audio, ethernet, Wi-Fi and Bluetooth

## References:

*B560M AORUS ELITE (rev. 1.x) Key Features | Motherboard - GIGABYTE Global.* (n.d.).

<https://www.gigabyte.com/Motherboard/B560M-AORUS-ELITE-rev-1x#kf>

BasuMallick, C. (2024). What is Motherboard. *Spiceworks*.

<https://www.spiceworks.com/tech/hardware/articles/what-is-motherboard/>

*Computer motherboard history.* (2024, March 10).

<https://www.computerhope.com/history/motherboard.htm>

Dfi, E. J. F. (2024, February 20). Everything You'll Ever Need to Know About ATX Motherboards. *DFI*.

<https://blog.dfi.com/en/atx-motherboards>

Shimpi, A. L. (2003, September 18). *Balanced Technology eXtended (BTX) Form factor - the future of cases & motherboards.* AnandTech. <https://www.anandtech.com/show/1157/2>

Staff, B. (2022, August 22). *Types of motherboards: Motherboard sizes explained.* Beebom.

<https://beebom.com/motherboards-sizes-types-compared/>

Teja, R. (2024, September 18). *Motherboard sizes | Comparison of ATX, E-ATX, Micro-AT and Mini-ITX.* ElectronicsHub. <https://www.electronicshub.org/motherboard-sizes/>

Volle, A. (2023, April 21). *Motherboard | Definition, History, & Facts.* Encyclopedia Britannica.

<https://www.britannica.com/technology/motherboard>