Portfolio #5

Comparative Study On Different Types Of Motherboards

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Introduction

Referred to as the “backbone” or “spine” of the computer, the motherboard or also referred to as a “Printed Circuit Board” serves as the link between different hardware components such as processors, graphic cards, etc. Being the “spine” of a computer, it is the largest component visible in a computer system. The central processing unit or simply CPU is often called the computer’s brain but not many people, know that the motherboard is also considered as such. The motherboard supports the BIOS or the Basic Input Output System initializing the computer’s firmware, hardware, and software, making it one of the brains.

History

Before motherboards were invented, backplanes were used instead. Backplanes were generally the same as motherboards, except they lacked processing or storage elements. Their purpose was generally just to connect different devices together.

The first backplane to qualify as a motherboard according to Volle (2023) on his article in the history of motherboards, was the Planar Breadboard, designed by an IBM engineer Patty McHugh. This was during the 1980s and was used in the 1981 IBM Personal Computer.

The 1980s and 1990s were the years when motherboard design was very progressive due to the demand for performance and the goal to make the components present in the motherboard smaller. The introduction of advanced-technology (AT) and advanced-technology extended (ATX) standardized motherboard dimensions and mounting points, making it compatible across different computer cases and components.

In the 21st century, the introduction of Field Programmable Gate Arrays (FPGAs) and other advanced technologies into motherboards has greatly improved and redefined the capabilities of motherboards.

As years go by, parts get smaller and performance has been rapidly advancing within these motherboards and hardware components, generating new possibilities within the computing world. In addition, researchers address issues regarding electronic waste and innovators look into the future with performance and sustainability in mind.

Discussion

To further understand how a motherboard connects other hardware components together, we first look at its parts.

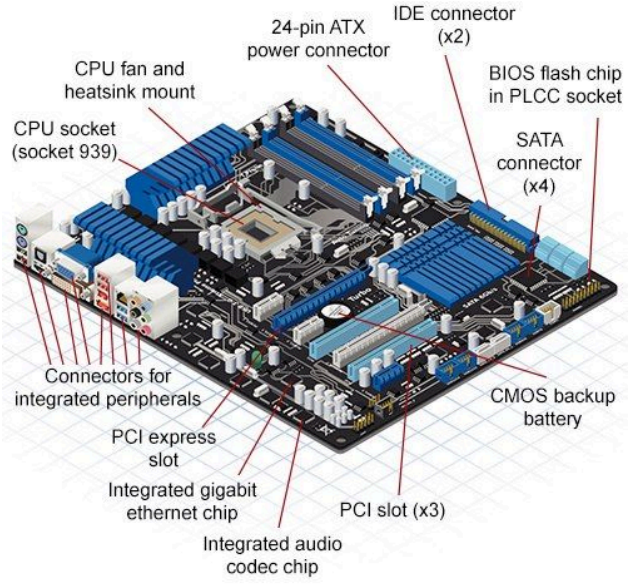

Figure 1. ATX motherboard

PARTS OF A MOTHERBOARD

1. **I/O ports**- located in the rear panel of the CPU. Used to connect outside hardware and peripheral devices to the computer.

2. **ATX Power connector (4 pin)** - used to connect the 4 pin of the power supply unit (PSU). This is different and separate from the 20/24 pin of the ATX power supply that provides DC voltage to computer processor.

3. **IDE connector (Integrated Drive Electronics) -** The connector used to connect the IDE cable of Hard Disk Drive (HDD)/Solid State Drive(SDD)/ CD/DVD ROM to the motherboard IDE.

4. **Processor's ZIF Socket** - part of the motherboard use to hold the processor or CPU chip. The compatibility of the socket depend on the computer processor type.

5. **Memory slot -** the slot where the computer memory or RAM is placed.

6. **CMOS/BIOS BATTERY -** the CMOS battery provides 3 volts of DC to preserve the BIOS settings of the computer.

7. **ATX Power connector (24 or 28 pin) -** It provides DC power output to the system board from the the Power Suppl Unit.

8. **SATA Connectors -** this is the Serial Advanced Technology Attatchment. The new standard of the IDE connection array of the computer HDD to the motherboard system.

9. **PCI slots -** a part of the motherboard used to connect the I/O cards of the computer.

10. **PCI express slot -** a part of the computer that holds the computer video card (**VGA)**.

11. **North Bridge -** assigned to manage and control computer memory before CPU chip's processing.

12. **South Bridge -** a microchip tasked to control I/O devices of the computer.
In order to further understand the composition of motherboards we must look at the different types of motherboard from its form factor.

13. **CMOS/BIOS -** A set of program installed into the motherboard that preserves BIOS configuration settings.

14. **Name of Vendor** - manufacturer's name

15. **Motherboard Version Number** - important for getting the version number of the motherboard driver software.

16. **Front panel connectors** - used to connect Power LED, HDD, LED, Power switch and Reset switch of the computer.

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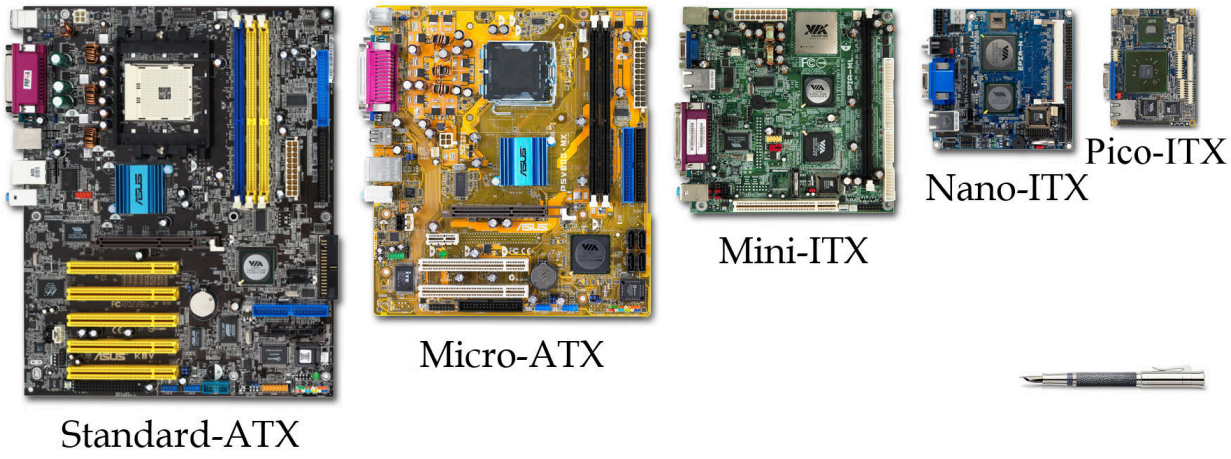

Figure 2. Different types of motherbods

The different types of motherboard mainly depends on their sizes EATX or Extended-ATX being the largest and Pico-ITX being the smallest. Few details also change with their form factors such as expandability and built-in features, giving a wide variety of choices for users depending on their needs and use cases.

The Main Types of Motherboards

1. **Standard-ATX** - the most common type, measures around 305 x 244mm but its size varies. It offers space for multiple expansion slots. It is usually used for gaming and high-performance PC's.
   Advantages:
   - Greater expansion capabilities
   - Better suited for multiple-GPU configurations and advance cooling solutions

   Disadvantages
   - Requires a large case, which may not fit in compact spaces.

2. **MicroATX** - more compact, measuring 244 x 244mm and offers fewer expansion slots but still provides ample connectivity for basic computing.
   Advantages:
   - Compatible with a wide range of cases
   - Supports single GPU setups effectively.

   Disadvantages
   - Limited space which may affect airflow and cooling options.

3. **Mini-ITX** - a small, space saving motherboard measuring 170 x 170mm. Regardless its size it has everything you need for a small gaming pc.
   Advantages:
   - Space-efficient
   - Low power system

   Disadvantages
   - Limited expansion capabilites

4. **E-ATX** - these are designed to extend the standard ATX form measuring 30.48 x 33.02 cm. It features multi-GPU set ups and include a higher RAM capacity.
   Advantages:
   - Excellent for high-end builds.

   Disadvantages
   - Expensive and needs full tower case.

There are many other different types that exists, and they are usually smaller than the E-ATX motherboard. Some of these form factors include NANO-ITX and PICO-ITX which are very small motherboards catering to ultra compact devices and specialized applications, such as digital signage and IoT devices.

Form Factor	Build	CPU Slots	Memory Slots	Chipsets	BIOS	PCI Slots	SATA	Built-In Features
AT Motherboard	12.0 x 13.8 in (size may vary)	1	4-8	Old Technology	Legacy	4-6	Not Standard	Basic, lacks integrated graphics
ATX Motherboard	12.0 x 9.6 in	1	2-4(up to 128 GB)	Advanced	UEFI	5-7	Standard (up to 8 ports)	Integrated graphics, sound, and network
BTX Motherboard	12.8 x 10.5 in (size may vary)	1	4	Modern	UEFI/Legacy	3-5	Standard (up to 8 ports)	Enhanced audio and video capabilties
Extended-ATX (E-ATX)	12.0 x 13.0 in or larger	1-2	Up to 8 slots(up to 128 GB)	Advanced	UEFI	8	Standard (up to 8 ports)	Advanced networking, audio and enhanced power delivery systems
LPX Motherboard	Around 9.0 x 13.0 in	1	2-4	Old Technology	Legacy	Uses riser cards	Not Standard	Basic, lacks modern integrated components
Micro-ATX	9.6 x 9.6 in	1	4 slots (up to 64GB)	Modern	UEFI	4	Standard (up to 4-6 ports)	Integrated graphics and sound
Mini ITX	6.7 x 6.7 in	1	2 (up to 32GB)	Modern	UEFI	1-2	Standard (up to 2-4 ports)	Integrated graphics and sound
Mini-ATX	Around 11.2 x 8.2 in	1	Slots vary (16GB)	Modern	UEFI	2-4	Standard (up to 4-6 ports)	Integrate graphics and sounds
Pico BTX	Around 10.4 x 8.0 in	1	Up to 2	Modern	UEFI	1-2	Standard (up to 4-6 ports)	Basic integrated graphics and sound

Standard-ATX	12.0 x 9 .6	1	2-4(up to 128GB)	Advanced	UEFI	5-7	Standard (up to 8 ports)	Integrated graphics, sound, and network

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