COMPARATIVE STUDY ON DIFFERENT TYPES OF MOTHERBOARDS

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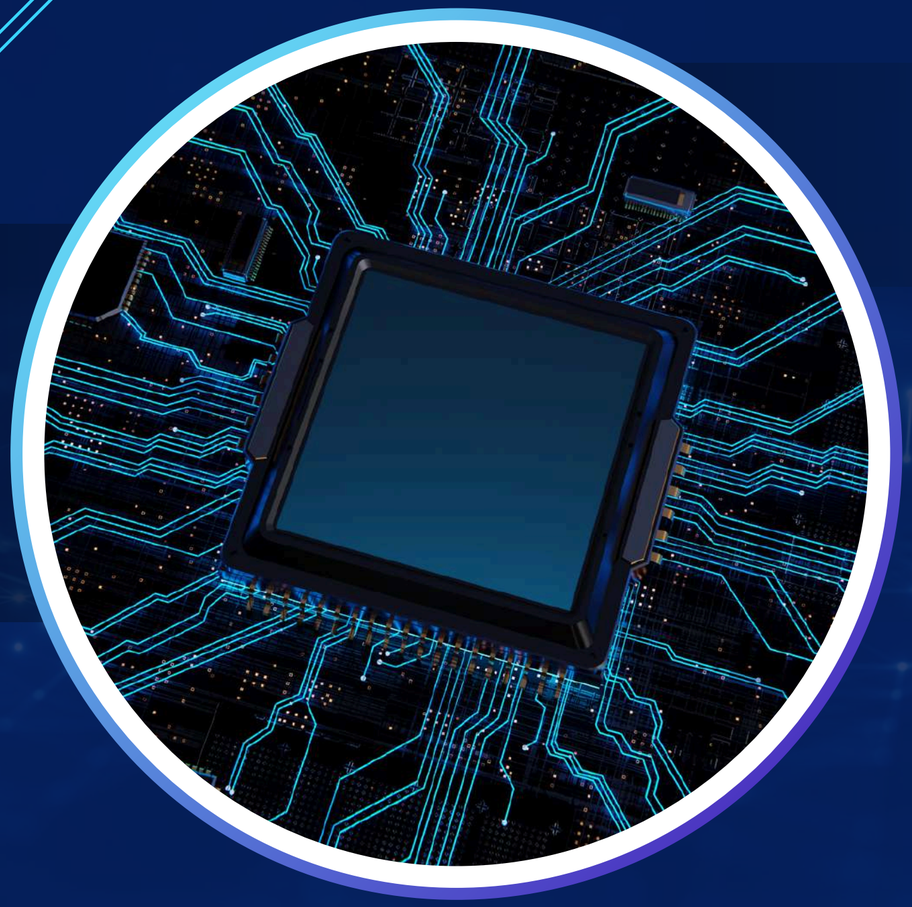
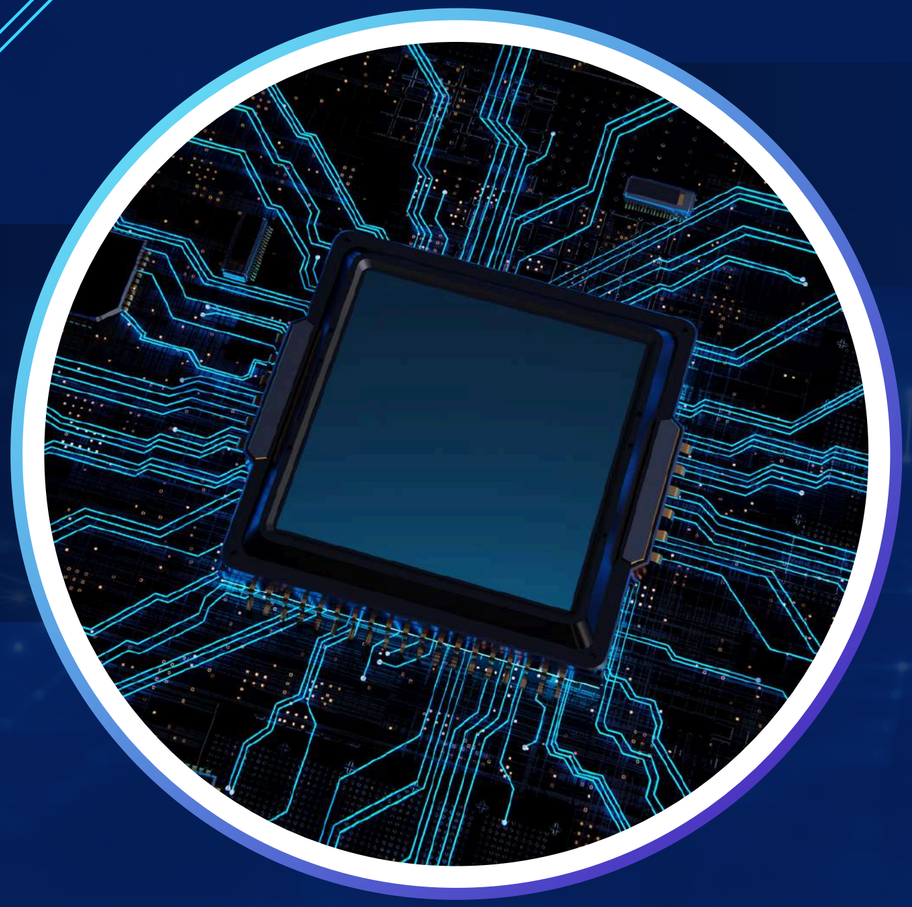


INTRODUCTION

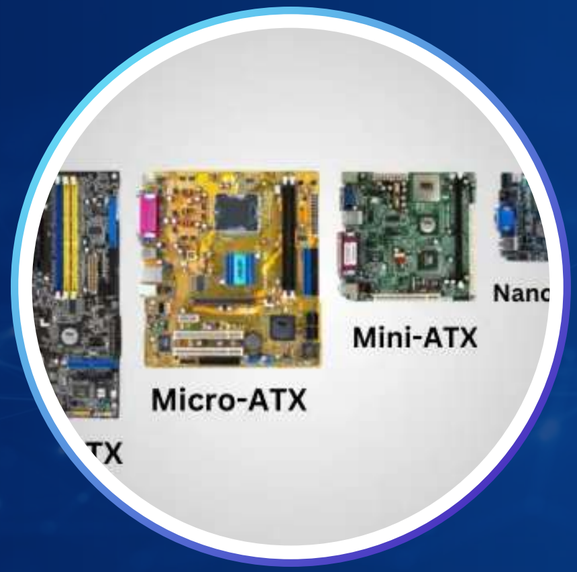
As the central line among all the components of computer systems and hardware, motherboards assume great importance as connectors and as defining and organizing factors. Due to this, the choice of various types of motherboards can be a complicated affair since each type has been developed to offer unique functionality and compatibility. In this paper, the author embarks on a detailed comparison of various motherboards with an emphasis on their form factors, chipsets, integrated features, and their general operations. In extending the knowledge of these components, the paper's purpose is to outline their strengths and weaknesses as well as their suitability. Furthermore, it takes note of technological innovation and tendencies that consumers and business people can apply to make the appropriate decision on a proper motherboard to select depending on the relevant needs.

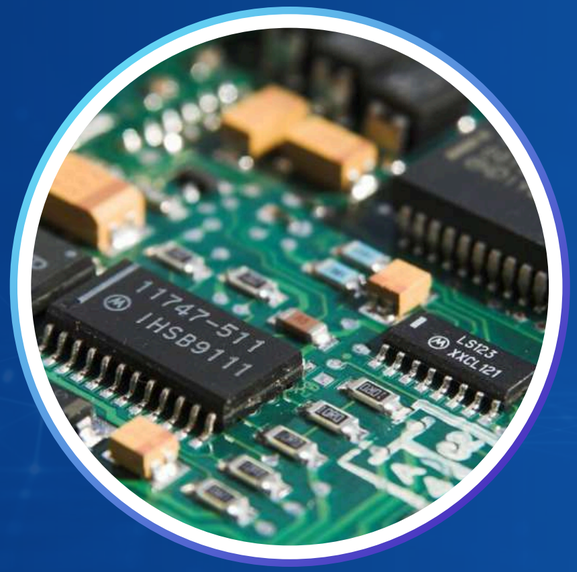


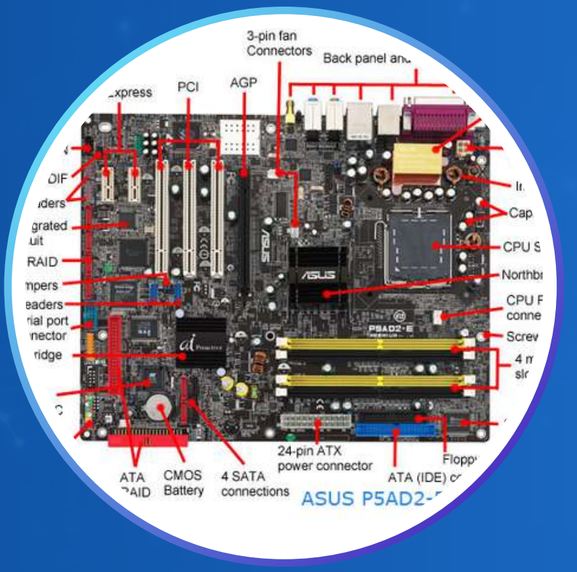
DISCUSSION

This study shows that each kind of motherboard has its strengths and drawbacks; thus, such products can be used as specialized tools. The ATX motherboards for example offer a lot of space for expansion and are perfect for gaming or Office PCs. Micro-ATX and mini-ITX boards are smaller in size, and ideal for those who have limited space, or constructing easily movable systems. Chips also differ a lot and they determine compatibility with the processors and additional features like frequency tobacco and multi GPU support. All the variations described above are in line in pointing to the fact that the best motherboard to purchase needs to be one that is in tune with the specific use and requirements of the particular computer system in question. Moreover, superior powers of delivering and increased connectivity options inherent to the motherboard designs exclusively depict their growth. This discussion focuses on the importance of the motherboards bearing the stamp of the system's performance and flexibility.

MOTHERBOARDS







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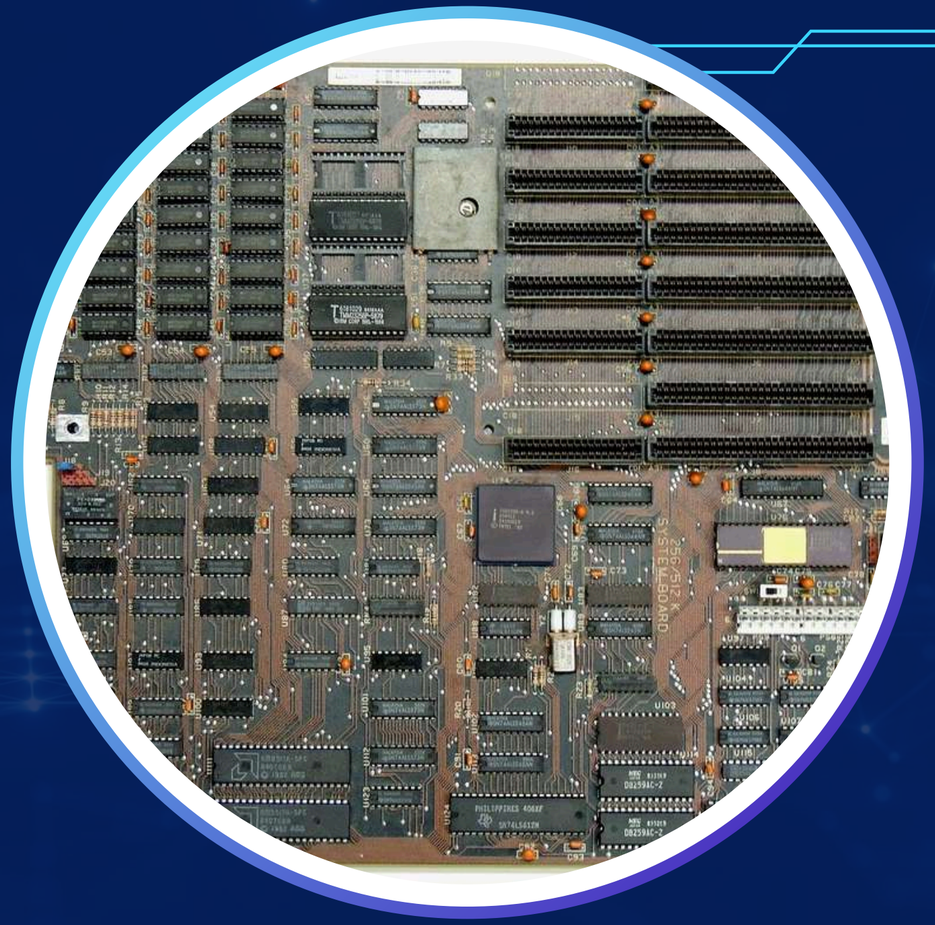
AT MOTHERBOARDS



AT MOTHERBOARD

Build

Usually it is fiberglass framed with copper or aluminum foil strip utilized for the high-frequency signal carrying path. Has a two-row pin power connector on the option of P8 & P9 for the supply of power.

CPU Slots

Works with older socket types as Socket 7 or socket 370.

Memory Slots

Has spaces for either SIMM (Single Inline Memory Modules) or initial models of DIMMs. But, it supports memory up to 16 MB to 64 MB only.

AT MOTHERBOARD

Chipsets

Chipset brands include; VIA, Intel, SiS.

BIOS

Operated on basic BIOS firmware in order to manage system.

PCI Slots

Limited ISA (Industry Standard Architecture). 3-4 Slots.

AT MOTHERBOARD

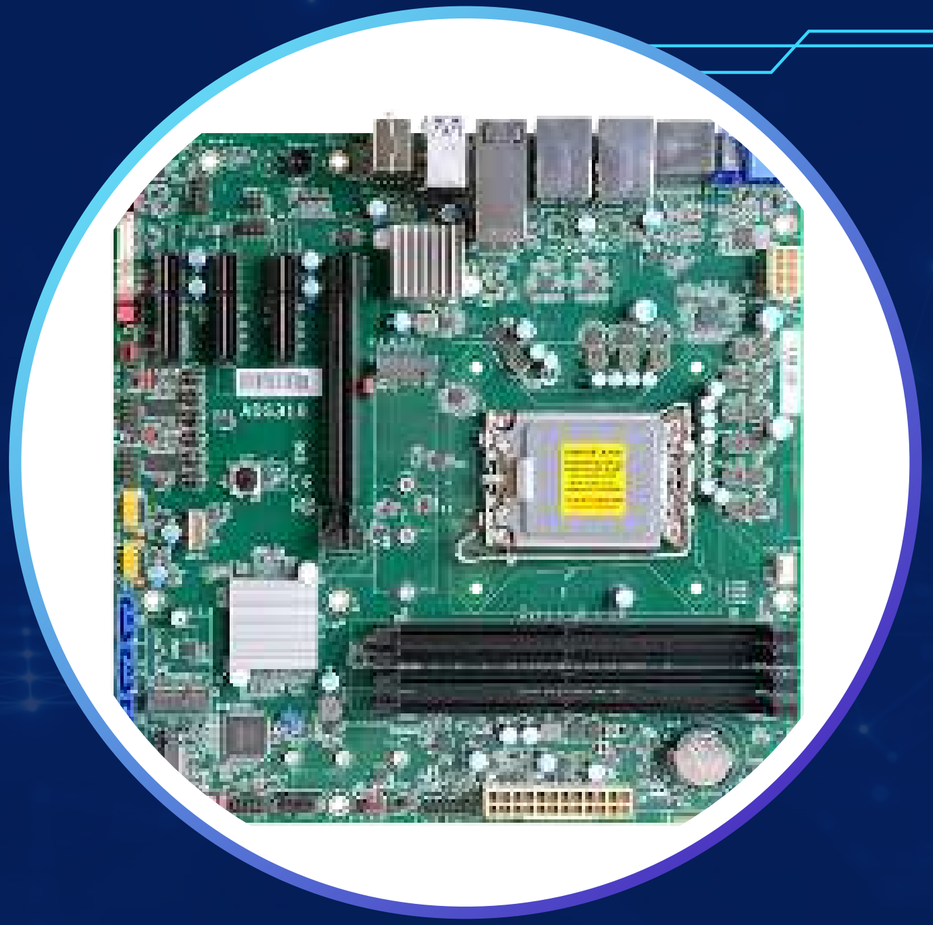
SATA

Depends on earlier forms of storage connectivity such as IDE (Integrated Drive Electronics) or none.

Built in Features

It does not have a USB or any cables of the modern world form of connectivity.

ATX MOTHERBOARDS



ATX MOTHERBOARD

Build

Standardized layout; optimized for high-performance computing environment.

CPU Slots

1 (Supports Intel/AMD processors, depending on model).

Memory Slots

It has 2 – 4 DIMM slots, supporting DDR4 or DDR5 RAM.

ATX MOTHERBOARD

Chipsets

Intel Z790, AMD B650, etc.

BIOS

UEFI BIOS with graphical interface and advanced settings.

PCI Slots

1–2 PCIe x16, 2–4 PCIe x1 slots.

ATX MOTHERBOARD

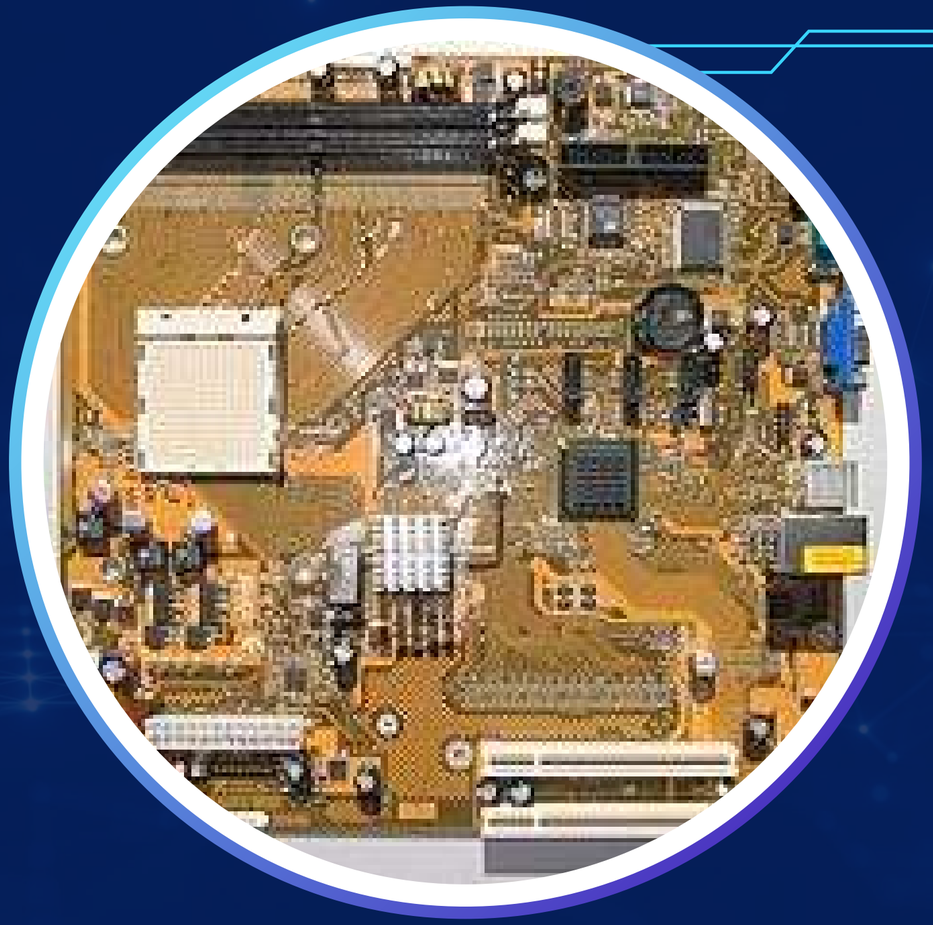
SATA

4–6 (SATA 3.0, 6Gbps).

Built in Features

Onboard audio, Ethernet, USB 3.2 ports, M.2 slots for NVMe storage.

BTX MOTHERBOARDS



BTX MOTHERBOARD

Build

Balanced Technology Extended (BTX) design focused on efficient cooling and airflow, typically larger than ATX.

CPU Slots

Single socket, compatible with Intel processors, such as Pentium 4 and later models.

Memory Slots

Contains 4 slots, supporting DDR or DDR2 memory, with a capacity of 4 GB to 8 GB.

BTX MOTHERBOARD

Chipsets

Optimized for Intel chipsets of the mid-2000s, like the 915/925 series.

BIOS

Text-based BIOS with standard customization options.

PCI Slots

3-4 PCI and PCIe slots for add-ons like GPUs or network cards.

BTX MOTHERBOARD

SATA

Typically included 2-4 SATA ports for storage devices.

Built in Features

Improved thermal design; some models featured integrated audio and Ethernet.

EXTENDED-ATX MOTHERBOARDS

EXTENDED-ATX MOTHERBOARD

Build

Large form factor, ideal for high-performance gaming, workstations, and server setups.

CPU Slots

One or two CPU sockets, supporting Intel and AMD processors.

Memory Slots

Four to eight slots, supporting dual or quad-channel configurations, up to 256 GB or 1 TB+ of DDR4 or DDR5 RAM.

EXTENDED-ATX MOTHERBOARD

Chipsets

Intel: X299, Z790, W680 AMD: TRX40, WRX80, X670E.

BIOS

UEFI BIOS, offering advanced features like overclocking, secure boot, and fan control.

PCI Slots

Three to five PCIe x16 slots for GPUs, typically supporting PCIe 4.0 or PCIe 5.0, one additional PCIe x4/x1 slots for expansion cards.

EXTENDED-ATX MOTHERBOARD

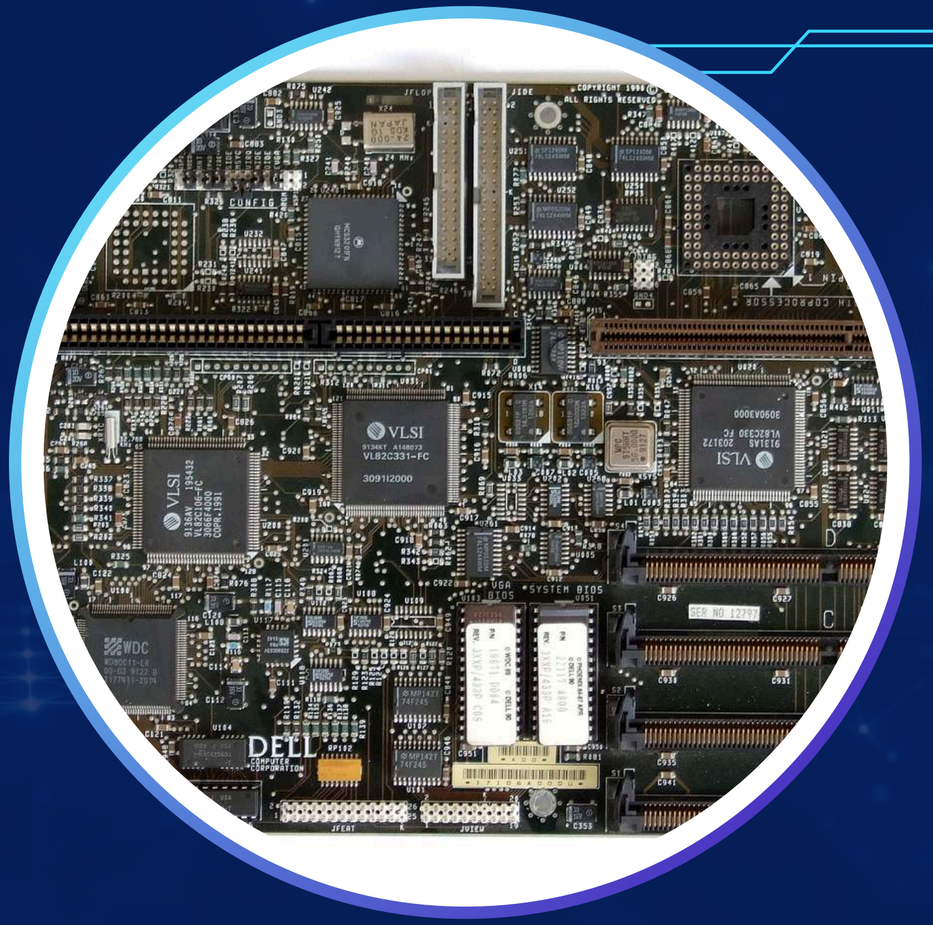
SATA

Six to twelve SATA III ports for SSDs/HDDs.

Built in Features

Wi-FI, Bluetooth, USB 3.2, USB 4, Thunderbolt 4, HDMI, DisplayPort, High-definition 7.1, storage expansion, cooling, RGB and reinforced PCIE slots.

LPX MOTHERBOARDS



LPX MOTHERBOARD

Build

Typically 13 × 9 in (330 × 229 mm) with a low-profile design.

CPU Slots

Supports Socket 7 for Pentium processors up to 200 MHz.

Memory Slots

Contains four 72-pin SIMM(Single inline memory module) sockets, max 128 MB RAM.

LPX MOTHERBOARD

Chipsets

it supports Intel 82430HX PCIset, including the 82439HX controller and PIIX3 bridge.

BIOS

Firmware stored in non-volatile memory; specific versions vary by manufacturer.

PCI Slots

Configured via a riser card for multiple expansion slots on PCI and ISA.

SATA

It mostly lacks native SATA support; IDE interfaces are far more common compared to this.

Built in Features

Wi-FI, Bluetooth, USB 3.2, USB 4, Thunderbolt 4, HDMI, DisplayPort, High-definition 7.1, storage expansion, cooling, RGB and reinforced PCIE slots.

LPX MOTHERBOARD

MICRO-ATX MOTHERBOARDS

MICRO-ATX MOTHERBOARD

Build

244mm x 244mm (9.6" x 9.6").
Smaller than ATX but larger than Mini-ITX, offering a balance of compactness and functionality.

CPU Slots

Supports latest CPU sockets such as AMD's AM5 and Intel's LGA 1700. If you wish to use other different processors ensure compatibility.

Memory Slots

Typically, Micro-ATX boards feature 2 to 4 DIMM slots supporting DDR4 or DDR5 RAM. For optimal performance, choose memory compatible with your motherboard’s specifications.

MICRO-ATX MOTHERBOARD

Chipsets

Supports chipsets like AMD B550, B650, or Intel B760, these chips offer the best balance of performance for gaming and productivity when utilizing this motherboard.

BIOS

User-friendly interface that allows for go to features such as one-click overclocking and hardware monitoring which allows for better customization and ease on troubleshooting.

PCI Slots

Contains one PCIe x16 slot for GPUs and an additional smaller PCIe x1 slot for addons.

MICRO-ATX MOTHERBOARD

SATA

These boards usually include multiple SATA ports for SSDs/HDDs and at least one M.2 slot for high-speed NVMe drives, supporting fast storage solutions.

Built in Features

Include integrated built -in Wi-Fi, RGB lighting control, robust VRM cooling and comprehensive I/O panels for connectivity.

MINI ITX MOTHERBOARDS

MINI ITX MOTHERBOARD

Build

Ultra-compact, ideal for small form factor PCs and HTPCs.

CPU Slots

One CPU socket, compatible with Intel and AMD processors depending on the model.

Memory Slots

Two slots, supports dual-channel configurations, up to 32GB or 64GB of RAM (varies by model).

MINI ITX MOTHERBOARD

Chipsets

- Intel: H610, B660, Z690 (for 12th or 13th Gen Intel Core processors).
- AMD: B550, X570 (for Ryzen 3000 and 5000 series processors).

BIOS

UEFI BIOS, user-friendly interface with advanced features, including overclocking support for high-end models.

PCI Slots

One PCIe x16 slot for graphics cards or expansion cards.

MINI ITX MOTHERBOARD

SATA

It supports 2–4 SATA III ports for SSDs and HDDs.

Built in Features

Integrated Wi-Fi and Bluetooth, onboard audio with HD codec, high-speed USB ports (USB 3.2 Gen1/Gen2), gigabit Ethernet port (or 2.5GbE on newer models), compact design with efficient power delivery components.

MINI-ATX MOTHERBOARDS

MINI-ATX MOTHERBOARD

Build

Compact and perfect for small form factor PCs.

CPU Slots

One CPU socket that supports various Intel and AMD processors.

Memory Slots

Two slots, supports dual-channel configurations, up to 64GB of RAM.

MINI-ATX MOTHERBOARD

Chipsets

Intel: H610, B660, Z690; AMD: B550, X570

BIOS

UEFI BIOS, user-friendly interface with advanced features.

PCI Slots

One PCIe x16 for graphics card, one PCIe x1 for expansion cards.

MINI-ATX MOTHERBOARD

SATA

Typically 4 SATA ports for multiple storage drives (HDDs or SSDs).

Built in Features

Wi-Fi, Bluetooth, USB 3.2, HDMI, DisplayPort, sometimes Thunderbolt, RGB lighting, cooling.

PICO BTX MOTHERBOARDS

PICO BTX MOTHERBOARD

Build

Ultra-small design, typically used in small or compact PC builds.

CPU Slots

Typically 1 CPU socket, supports Intel and AMD processors.

Memory Slots

it has 4 x 240-pin DDR2 DIMM slots, supporting up to 4 GB of DDR2-800 memory or up to 8 GB of DDR2-667/533 memory.

PICO BTX MOTHERBOARD

Chipsets

Lightweight, efficient chipsets (e.g., Intel 915, AMD 690G).

BIOS

Firmware interface for system settings and hardware configuration.

PCI Slots

1 PCI Express x16 slot for graphics or other high-bandwidth cards.

PICO BTX MOTHERBOARD

SATA

4 x SATA 3 Gb/s ports for connecting storage devices such as hard drives and SSDs.

Built in Features

Low power consumption, integrated I/O ports (USB, HDMI, Ethernet), minimalistic setups.

STANDARD-ATX MOTHERBOARDS

STANDARD-ATX MOTHERBOARD

Build

Standard Layout.

CPU Slots

Typically 1 CPU socket, supports Intel and AMD processors.

Memory Slots

4-6 slots, supports dual or quad-channel memory.

STANDARD-ATX MOTHERBOARD

Chipsets

Mainstream, modern chipsets (e.g., Intel Z690, AMD X570).

BIOS

Firmware interface for system settings and hardware configuration.

PCI Slots

Multiple PCIe slots for graphics cards, network adapters, etc.

STANDARD-ATX MOTHERBOARD

SATA

4-8 ports for connecting storage devices (HDD/SSD).

Built in Features

Balanced expandability, Integrated I/O ports (USB, HDMI, Ethernet), audio jacks, etc. Suitable for most needs.

REFERENCES

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