Motherboard

A motherboard (also called mainboard, main circuit board, system board, baseboard, planar board, logic board, or mobo) is the main printed circuit board (PCB) in general-purpose computers and other expandable systems. It holds and allows communication between many of the crucial electronic components of a system, such as the central processing unit (CPU) and memory, and provides connectors for other peripherals. Unlike a backplane, a motherboard usually contains significant sub-systems, such as the central processor, the chipset's input/output and memory controllers, interface connectors, and other components integrated for general use.

Components of a Motherboard.

1. CPU (Central Processing Unit) chip

CPU is the electronic circuitry in a computer that executes instructions that make up a program. It is also known as a central processor or the main processor. The CPU executes the basic logic, arithmetic, controlling as well as input/output (I/O) operations specified by the instructions in the desktop programs.

2. RAM (Random Access Memory) slots

RAM is a kind of computer memory that can be read and written. It is mainly used to save data and machine code. A RAM device permits data to be read or written in nearly the same amount of time no matter where the data's physical location is in the memory. Compared to the direct-access storage devices like hard drives, CD/DVD and magnetic tapes, RAM media is much faster for data reading and writing.

3. Southbridge/northbridge

They are the two chips in the core logic chipset on the motherboard. Typically, the southbridge implements the slower capabilities of the motherboardin a northbridge/southbridge chipset computer architecture.The northbridge, also known as host bridge or Memory Controller Hub, is connected directly to the CPU via the front-side bus (FSB). It is responsible for tasks requiring the highest performance. Together with the southbridge, they manage communications between the CPU and other motherboard components.

4. BIOS (Basic Input/Output System)

BIOS, also called system BIOS, PC BIOS or ROM BIOS, is firmware that is used to perform hardware initialization during the booting process; and to provide runtime services for operating system and programs. The BIOS firmware is the first software to run when powered on; it is re-installed on a PC's system board.

5. I/O port

Input/output ports are the connections between the CPU and peripheral devices on a motherboard. There are two complementary methods to perform input and output processes: memory-mapped I/O (MMIO) and port-mapped I/O (PMIO). Alternatively, you can use dedicated I/O processors, called channels on mainframe computers, which execute their own instructions.

6. USB (Universal Serial Bus)

USB is an industry standard that creates specifications for connectors, cables and protocols for connection; power supply (interfacing) and communication among computers, computer peripherals as well as other desktops. There are a great many USB hardware including several different connectors, of which USB-C is the latest kind.

7. CPU slot

A CPU slot, also called a CPU socket or Processor socket, contains one or more mechanical components that provide mechanical and electrical connections between the PCB and a microprocessor (CPU). Therefore, you can install a CPU on a motherboard without soldering.

8. PCI (Peripheral Component Interconnect) slot

Peripheral Component Interconnect is a local computer bus for connecting hardware to a computer. It supports all the functions of a processor bus. PCI is usually been called Conventional PCI to distinguish it from its successor PCI Express (PCIe, PCI-e or PCI-E).PCI Express is a high-speed serial computer expansion bus standard designed to replace the older PCI, PCI-X and AGP bus standard. It is a general-use motherboard interface for the graphics card, SSDs, hard drives, Wi-Fi as well as Ethernet hardware connections.

9. AGP (Accelerated Graphics Port) slot

AGP was designed as a high-speed point-to-point channel for connecting a video card (graphics card) to a computer system. Primarily, it was used to assist in the acceleration of 3D computer graphics. AGP is originally designed to be a descendant of the PCI series of connections for video cards. Yet, it was replaced by the PCIe slots.

10. ISA (Industry Standard Architecture) slot

ISA is the 16-bit internal bus of IMB PC/AT and similar computers that are based on Intel 80286 and its immediate successors during the 1980s. It was backward compatible with the 8-bit bus of the 8088-based IBM PC largely.There once was an attempt to extend ISA into a 32-bit bus, called Extended Industry Standard Architecture (EISA). The attempt wasn’t very successful and the EISA was largely replaced by the later VESA Local Bus and the PCI bus.

11. Parallel port

A parallel port is a kind of interface for attaching peripherals on desktops. The name of this kind of port is derived from the way the data is sent. That is, the parallel ports send multiple

bits of data at the same time. Serial interfaces, on the contrary, send bits one data at once. To achieve parallel data transfer, there are multiple data lines in the parallel port cables. The parallel port cable is larger than the cable of a contemporary serial port, which only has one data line within.

12. FDC (Floppy-Disk Controller)

FDC is a special-purpose chip and associated disk controller circuitry. It controls and directs reading from and writing to a computer's floppy disk drive (FDD).

13. IDE (Integrated Drive Electronics) controller

The devices used for connecting IDE, Ethernet, FireWire, USB and other systems can be called host adapter. So, the IDE controller refers to the host adapter. A host adapter, also called a host controller or a host bus adapter (HBA), connects a computer (acting as the host system) to other network and storage devices.

14. CMOS (Complementary Metal-oxide-semiconductor) battery

CMOS battery, also called memory battery, clock battery or real-time clock (RTC), is generally a CR2032 lithium coin cell. The lifespan of the CMOS battery is estimated to be three years when the power supply unit (PSU) is unplugged or switch off.

15. Power supply connector

A power supply provides the necessary electrical power to let the computer to work. It takes standard 110-Volt AC (Alternative Current) power to DC (Direct Current) power of 12 Volt, 5 Volt, 3.3 Volt, etc.

16. Mouse and keyboard ports

All computers have a keyboard port connected directly to the motherboard. There are two types of connectors. The oldest one is a special DIN (Deutsches Institut für Normung) connector while the newest one is the mini DIN PS/2-style connector. Many PCs use the PS/2-style connectors for both keyboard and mouse; and the connectors are marked clearly for different usage.

17. DIP (Dual In-line Package) switch

A DIP switch is a manual electric switch packaged with others in a standard dual in-line package. The term may refer to an individual switch or the whole unit. The DIP switch is designed to be used on a printed circuit board (motherboard) together with other electronic motherboard components. It is usually used to customize the behavior of an electronic device for specific situations.

18. Jumper

A jumper is a short length of conductor that is used to close, open or bypass part of an electronic circuit. Typically, jumpers are used to set up or configure printed circuit boards like the motherboard.

19. Heat sink/heatsink (cooling system)

A heat sink is a passive heat exchanger that transfers the heat generated by parts of motherboard into a fluid medium like liquid or air. The fluid medium will dissipate away from the device. Thus, the temperature of the device is kept within a tolerable range. On the motherboard, the heatsink is usually used to cool CPU, GPU (graphics processing unit), chipsets and RAM modules.

20. Clock generator

A clock generator is an electronic oscillator (circuit) that produces a clock signal for usage in synchronizing a circuit's operation. The clock signal ranges between high and low frequencies, thus creating a metronome for the coordination of actions.

Daughter Cards

A daughterboard (or daughter board , daughter card , or daughtercard) is a circuit board that plugs into and extends the circuitry of another circuit board. The other circuit board may be the computer's main board (its motherboard) or it may be another board or card that is already in the computer, often a sound card. The term is commonly used by manufacturers of wavetable daughterboards that attach to existing sound cards.

A mezzanine card is a kind of daughterboard that is installed in the same plane as but on a second level above the motherboard.

Motherboard vs Daughter Board

The name of these two boards are quite interesting, right? The names have their own significance. As you know the motherboard is named like that because of its functionalities. It works as a heart of a system. Most of the components are connected to the motherboard and get their necessary power from it. The daughter board is named like that because of its functionalities too. A daughter board is connected to the motherboard or expansion card. It is smaller than the motherboard. The daughter board is directly connected to the motherboard by soldering. A daughter board extends the circuitry of the motherboard or expansion card in which it is plugged into.

Functionalities of a Daughter Board

A daughter board is a circuit board that is directly connected to the motherboard or expansion card by soldering. Sometimes, people think that daughter board and expansion card are same. But this not true. They have their own functionalities. Daughter board's functionalities are given below:

It is known as the piggyback board, riser card, daughtercard etcetera. A daughter board is smaller than a motherboard and may have some slots like the motherboard.A daughter board is a printed circuit board which is connected to the motherboard or expansion card. Unlike expansion card, daughter boards are directly connected to the motherboard by soldering. Daughter boards do not provide new functions to the circuit like an expansion But

they extend the circuitry of the circuit in which they are plugged into. Daughter boards are released by the vendors as an update of motherboard or expansion card.

RAM Modules

A memory module or RAM (random-access memory) stick is a printed circuit board on which memory integrated circuits are mounted. Memory modules permit easy installation and replacement in electronic systems, especially computers such as personal computers, workstations, and servers. The first memory modules were proprietary designs that were specific to a model of computer from a specific manufacturer.

Types of memory module include:

- TransFlash Memory Module
- SIMM, a single in-line memory module
- DIMM, dual in-line memory module
- Rambus memory modules are a subset of DIMMs, but are normally referred to as RIMMs
- SO-DIMM, small outline DIMM, a smaller version of the DIMM, used in laptops

TransFlash Memory Module: The TransFlash product is an ultra small, semi-removable flash memory module based on the miniSD card and TriFlash designs for future mobile phone products, especially the transfer of personal content between TransFlash-enabled phones.

SIMM: A SIMM (single in-line memory module) is a module containing one or several random access memory (RAM) chips on a small circuit board with pins that connect to the computer motherboard. Since the more RAM your computer has, the less frequently it will need to access your secondary storage (for example, hard disk or CD-ROM), PC owners sometimes expand RAM by installing additional SIMMs.

DIMM: A DIMM or dual in-line memory module, commonly called a RAM stick, comprises a series of dynamic random-access memory integrated circuits. These modules are mounted on a printed circuit board and designed for use in personal computers, workstations, printers, and servers.

Bus Slots

Bus Slots or an expansion slot is connection or port located inside a computer on the motherboard or riser board that allows a computer hardware expansion card to be

connected. For example, if you wanted to install a new video card in the computer, you'd purchase a video expansion card and install that card into the compatible expansion slot.

The Types of PC Expansion Slots

PCI Express: The best type of expansion slot to have in your PC is the PCI Express, also written as PCIe. Without boring you, the PCI Express type of expansion slot communicates with the motherboard, and therefore with the microprocessor, both quickly and efficiently.

PCI: The PCI slot is the most common form of internal expansion for a PC.Some PCs have a mixture of PCI and PCI Express slots. If so, go with PCI Express when you have that option.

AGP: This type of expansion slot was specifically designed to deal with graphics adapters. In fact, AGP stands for Accelerated Graphics Port. Older PCs may sport this expansion slot, but the best video cards use PCI Express.

ISA: The most ancient type of expansion slot is the ISA, which stands for (get this) Industry Standard Architecture. That's because it never really had a name until another, better type of expansion slot came along. ISA slots hang around to be compatible with older expansion cards.

SMPS

The full form of SMPS is Switched Mode Power Supply also known as Switching Mode Power Supply. SMPS is an electronic power supply system that makes use of a switching regulator to transfer electrical power effectively. It is a PSU (power supply unit) and is usually used in computers to change the voltage to the appropriate range for the computer.

An SMPS adjusts output voltage and current between different electrical configurations by switching the basics of typically lossless storage such as capacitors and inductors. Ideal switching concepts determined by transistors controlled outside of their active state that have no resistance when 'on' and carry no current when 'off.' It is the idea why switches with an ideal function will operate with 100 per cent output, that is, all input energy is provided to the load; no power is wasted as dissipated heating. In fact, such ideal systems do not exist, which is why a switching power source cannot be 100 per cent proficient, but it is still a vital improvement in effectiveness over a linear regulator.

Working principles of SMPS

In the SMPS device, the switching regulators are used which switches on and off the load current to maintain and regulate the voltage output. Suitable power generation for a system is the mean voltage between off and on. Unlike the linear power supply, the SMPS carry transistor switches among low dissipation, full-on and full-off phase, and spend much less time in high dissipation cycles, which decreases depleted strength.

Benefits of SMPS

- The switch-mode power source is small in scale.
- The SMPS is very lightweight.
- SMPS power consumption is typically 60 to 70 per cent, which is ideal for use.
- SMPS is strongly anti-interference.
- The SMPS production range is large.

Limitations of SMPS

- The complexity of SMPS is very large.
- The production reflection is high and its control is weak in the case of SMPS.
- Use of SMPS can only be a step-down regulator.
- In SMPS, the voltage output is just one.

Internal storage devices

Some storage devices are classed as 'internal' which means they are inside the computer case.Most computers have some form of internal storage. The most common type of internal storage is the hard disk.At the most basic level, internal storage is needed to hold the operating system so that the computer is able to access the input and output devices.It will also be used to store the applications software that you use and more than likely, the original copies of your data files.

Internal storage allows the data and applications to be loaded very rapidly into memory, ready for use. The data can be accessed much faster than data which is stored on an external storage device. This is because internal storage devices are connected directly to the motherboard and its data bus whereas external devices are connected through a hardware interface such as USB, which means they are considerably slower to access.Internal storage also means that if the computer is moved around, it will still retain its most commonly used data.

The main disadvantage of internal storage is that when the hard disk fails (and it will), all the data and applications may be lost.

This can be avoided to some extent by using more than one hard disk within the machine. Each hard disk has a copy of all the data, so if one fails the other can carry on. This is called a RAID array. An alternative is to use external drives for backup.

Interfacing ports.

A port is basically a physical docking point which is basically used to connect the external devices to the computer, or we can say that A port act as an interface between the computer and the external devices, e.g., we can connect hard drives, printers to the computer with the help of ports.

Features of Computer ports:

- We can connect external devices to the computer with the help of ports and cables.
- These are basically slots on motherboard where we connect external devices, or we can plug in external devices through cables.
- Mouse, keyboards, printers, speakers are some examples of external devices that connected to the computer through ports.

Types of ports:

1. Serial ports –

   - A serial port is basically a serial communication interface through which information transforms one bit at a time. It is one of the oldest type of interfaces.
   - These are basically used for external modems.
   - These are basically available in two versions in market these are 9 pins, 25 pin models.
   - Data travels at a speed of 115 kilo-bits per second.

2. Parallel ports –

   - A parallel port is basically a parallel communication interface through which information transforms multiple bits at a time.
   - These are basically used to connect peripherals such as scanners or printers.
   - These are also known as printer ports.
   - These are available in a 25 pin model.
   - Data travels at a speed of 150 kilo bits per second.

3. PS/2 ports –

   - These are basically 6 pin mini Din connector used to connect keyboard, mice to a PC compatible computers.
   - These are basically used by old computers for connecting mouse or keyboard.
   - These are called mouse ports.
   - These ports are still favoured in organisation for security reason.
   - These ports provides no restriction on key rollover.

4. Universal serial bus port –

   - It is basically a standard cable connection interface between computer and external device. USB is an industrial standard for short-distance digital data communication.
   - Basically it can connect all types of external devices to the computer such as mouse, keyboard, printers, speakers etc.
   - These ports were introduced in 1997.
   - Minimum 2 ports are there in every computer system.
   - Data basically travels at a speed of 14mb/s which is much faster than serial port.
   - The devices that uses USB port gets power from a USB port.

5. VGA Ports –

- VGA connector stands for Video Graphic Array connector, these are basically 15 pin connector available in many video-cards, computer, projectors etc.
- It is used to connect monitor to computer's video card.
- It is 15 pin connector.
- These were introduced by IBM in 1987.
- VGA basically utilizes analog signal hence it can only be used to lower resolution or we can say VGA is only capable of lowering the resolution.

These are some of the common ports available in computer system. Except these there are many more ports available in computer. These are as follows:

Modem Port: These are basically used to connect PC's modem to telephone networks.

Ethernet Port: These are basically used to connect Ethernet cables to the computer. In this data may travel with a speed of 10mb/s to 100 mb/s based on the network bandwidth.

Game Port: These ports are available in computer to connect joysticks which are now replaced by USB. Digital Video Interface or we can say DVI Port these are basically used to connect flat panel LCD Monitor to the computer's high end video graphics.

Sockets: Sockets are basically used to connect microphone or speakers to the sound card of the computer.