

What Is an Embedded Motherboard?

An embedded motherboard is a computing system that is integrated into a piece of hardware. While businesses might rely on industrial PC devices and other more traditional computers, smart technology goes far beyond this. And this is where embedded motherboards are making a big difference.

For example, a programmable manufacturing system in an industrial plant will have an embedded computer built into it. Patient monitoring systems in hospitals will also feature similar components. Essentially, any technology that has to do calculations or make decisions will need an embedded computer to serve as its 'brain'.

The Components of an Embedded Motherboard

To understand how the embedded motherboard works, we need to have a look at its internal components.

Central Processing Unit – CPU

If an embedded motherboard is the brain of an industrial system, the CPU is the frontal lobe. This is where all the main computation takes place, as the CPU interprets data according to its own pre-programmed instructions, and executes actions and functions based on this.

Random Access Memory – RAM

The RAM components are an area of temporary data storage within the embedded computer. The CPU can quickly find information from the RAM, so it doesn't need to delve into the data storage area to find the information it needs. This makes the industrial PC far more responsive and reliable. When the system is turned off or closed down, the temporary data stored in RAM will be lost.

Data Storage

This is where data is stored in the embedded computer over the long term. While the RAM provides the flexibility the computer needs to complete its regular function, the industrial PC will also need to store data permanently, even if the system is turned off or disconnected. Solid-state drives (SSDs) and hard disk drives (HDDs) are the most common forms of long-term data storage.

Connectivity Components

The embedded motherboard is part of a broader ecosystem, so it needs connectors and interfaces to carry out its functionality. This may be provided by a USB port or an Ethernet port built into the computer.

Fitting It All Together – How Does the Embedded Motherboard Work?

The defining feature of an embedded motherboard is that all the above components are deployed together on one unified piece of hardware. The components then work in a similar way to a standard industrial PC, but in a miniaturized format.

- The embedded motherboard receives an input via a connectivity interface, like a USB port.
- The CPU decides what kind of response is required.
- If the required response has been completed recently, the CPU draws residual data from the RAM.
- If it has not been completed recently, the CPU requests data from the permanent storage components – this will take longer.
- The CPU uses the necessary data to complete the action.

What's the Difference Between an Embedded Motherboard and a Single Board Computer?

[EPM-1712 DC/DC](#) connector embedded peripheral. Image via Avalue.

Embedded computers and single board computers are sometimes discussed interchangeably. However, while the two are quite similar, they are not one and the same. Let's take a look at what we are referring to here.

A single board computer, or an SBC, is basically a fully functional computing unit built into a single board. Everything the computer needs to function is housed on this board – including all the RAM, processors, and data storage components listed above.

So a product like the [ECM-ASL](#), with Intel® Processor N97, Intel® Core™ i3-N305 Processor & Intel Atom® x7000RE series 3.5" Micro Module, is completely self-contained. It doesn't need any external peripherals in order to function.

An embedded system can be a little more general. This is simply any computer system that is integrated into a unit to provide computing power to that unit. Applications range from the very simple – like a vending machine – to the highly complex, such as a diagnostic system in a healthcare environment.

These systems can be single board computers. As embedded systems typically need to be very small, it can be beneficial to keep everything on a single board. But this is not always the case.

For example, products like the [EPM-1712](#) Vehicle 100Watt Smart DC/DC Converter or the [EPM-1715](#) Supercapacitor UPS Module can add to the capability of an embedded system. The computer is still small and compact, but it's not necessarily built into a single board.

The Advantages of an Embedded Motherboard

Why use an embedded motherboard in your industrial computing setup? Here are a few of the key advantages of this technology.

Lowering Power Consumption

Embedded motherboards and computing systems tend to use significantly less power than traditional industrial PC computers. This is good news for businesses trying to reduce their carbon footprint.

Achieving Easy Installation

As the units are very small and designed to be integrated into other systems, installation is easy. You won't need to make space for the computer, as it is integrated into the hardware.

Fostering Smart Technology

The aim of an embedded computing system is to make the hardware smart. Rather than having to monitor and examine a collection of offline hardware solutions, the solutions can monitor themselves. Embedded motherboards become highly valuable in achieving a smart workspace during digital transformation.

Enhancing Reliability

Embedded motherboards are highly reliable. They are designed with a very specific function in mind, using the minimum of components required to make this happen. This reduces the chance that something will go wrong.

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