Hardware standardization is one of the greatest strengths of desktop PCs. You can mix and match parts to your heart’s content. But not all motherboards are the same physical size. There are different form factors for different types of PCs.

Different Standards

Just like other PC components, motherboards have standardized form factors, including ATX, MicroATX, and Mini-ITX. Nearly every motherboard for home computers at your local PC shop or online will be in one of these flavors.

Standardization means you can easily find a processor, RAM, power supply, and storage that works with your motherboard. It also opens up the choices for desktop PC cases. Numerous cases support all three of the major motherboard sizes. The mount points are drilled into the appropriate spots, and the proper space is available for the rear ports and accompanying I/O shield that covers them.

It’s a beautiful thing, but to decide which motherboard is right for you, you have to consider things like space, and your experience building PCs and performance needs.

PC Motherboards: The Basics
Intel created the ATX form factor and first introduced it in 1995. For nearly 25 years, the ATX design has been the predominant form factor for home and office PCs.

The largest of the three motherboard sizes we're looking at, the ATX measures 12 inches by 9.6 inches. The specification requires all ATX motherboards to be this size. It also specifies the locations of the mount points, the I/O panel, the power connectors, and all other various connection interfaces.

All these features are crucial for any motherboard. The mounting points keep the motherboard away from the case's metallic surface to prevent electrical shorts. The I/O panel and accompanying shield allow you to access your PC's rear ports for displays, audio, and USB. Then, you have the power connectors and all the other interface points that must be in predictable locations to aid system builders.

However, not everyone wants an ATX-sized motherboard—especially if the goal is to make something more compact. Enter, MicroATX boards, which measure just 9.6 inches by 9.6 inches. Like the larger ATX motherboards, the standard determines what all the various critical points must be.

Finally, the Mini-ITX, developed by Via Technologies in 2001, is the smallest of them all, measuring a mere 6.7 inches by 6.7 inches.

ATX motherboards have the most expandability. They typically have six (or fewer) PCIe slots for things like graphics, sound, and network cards. However, there are Extended ATX (or EATX) boards that have seven PCIe slots, but those are aimed at enthusiasts and servers and are beyond the scope of this article.

The MicroATX can have up to four PCIe slots, while the Mini-ITX has just one for a graphics card.
RAM is also limited on the Mini-ITX. It has room for just two slots versus four on the ATX or MicroATX boards. This doesn't mean Mini-ITX boards can't have a healthy amount of RAM, though. For example, if you want 32 GB of RAM, you just put two, 16 GB modules on it, whereas, the other two motherboards, you fill with 8 GB modules.

Motherboards: When to Use What

All three of these motherboard types work for almost any type of home PC you want to build, including a gaming rig, general entertainment system, or Office 365 dynamo.

But each form factor comes with some trade-offs—we'll cover those next.

Gaming

If it's your first time creating a gaming PC, then an ATX board is probably your best choice, with the MicroATX coming in second. The larger amount of space you get with an ATX makes it more forgiving, and you can slot all the various components into place with relative ease.

While ATX is great, there's no reason to stay away from a MicroATX if you're a newbie and want something a little more compact. Putting everything together is a bit tighter, but still doable. If you do decide to go with a MicroATX, though, pay attention to the case size. You don't want a case that also accepts ATX if you want to build something smaller. Also, some MicroATX cases are slightly wider than ATX-friendly mid-towers, so look carefully at the case dimensions.

Mini-ITX is the “hardest” of the three for gaming because there's very little room inside the case. You can create a solid gaming PC with a Mini-ITX board, but you have to carefully consider headroom for the graphics card, airflow, and cooling. There isn't a lot of room in a dedicated Mini-ITX case, especially when compared to a full ATX case.
Home Theater PC (HTPC)

Quite often, space is the prime consideration when you add another device to an already overflowing living room entertainment center. This is where a Mini-ITX really shines, as you get a full living room PC in a diminutive case. Of course, you can purchase an ATX case that works with Mini-ITX boards. But if you want it to fit on a shelf under your TV, you need something more compact.

We'd be remiss if we didn't mention an even smaller motherboard from Intel called the NUC. Intel introduced NUC kits as a way to build tiny, yet capable computers. NUC motherboards typically measure four by four inches, and the cases are a very tight fit.

Usually, you buy NUCs in a kit that includes the motherboard, processor, discrete graphics (which vary by kit), and RAM. It's up to you to add storage or peripherals; however, current NUCs do not accept full-size graphics cards. So, a NUC only works if you want a PC primarily for video streaming, home media library management, or casual games.

RELATED:

Family PC

Dealer’s choice! Family PCs should be capable, but they don’t have to be amazing performers since you use them primarily for video streaming, email, social networking, and web games. Take a good look at what you can get on sale and allow that to dictate how the build goes. If space is a concern, take a look at the MicroATX or Mini-ITX.
As mentioned previously, ATX is an old specification. In the technology world, it's hard to dislodge anything with that kind of staying power (see Windows XP). Intel tried to introduce a replacement for ATX called BTX in 2004, but it never caught on.

Computer manufacturers are still experimenting with alternatives to ATX, however. At Computex 2019, Asus showed off a high-end motherboard concept called Prime Utopia. It looked very cool and completely different from anything we have now. It's a two-sided motherboard, with the voltage regulator modules (VRMs) on the back, where they can be more easily cooled, and thus, boost performance. The graphics card is also on the rear, in a dedicated chamber for better cooling, and it's mounted vertically for more stability.

Asus made the I/O ports modular. This means you can pop in only what you need, like additional Ethernet ports or a whole lot of USB, and you can dump the mic and headphone ports altogether. And since having the graphics card in the rear frees up so much space and alleviates heat considerations, the Utopia also has four m.2 slots.

Concepts like the Prime Utopia are great, but it's unlikely we'll see a shift away from ATX in the near future. ATX and its related standards have served the PC enthusiast community well for several decades now. Everyone is used to them, and the best practices for building, maintaining, and cooling these PCs are well established.

All three of these motherboard types are quite capable of getting any job done. Your ultimate choice depends on the amount of space you have, your level of PC-building experience, and whether you want expandability for the future.