

# What is SSD Power Loss Protection? How does this technology work?

SSD Power Loss Protection is a technology designed to protect data from being damaged or deleted from an SSD when power is suddenly cut off.

With SSDs becoming more and more affordable, many people have switched to SSDs due to their speed, energy efficiency, and quiet operation. However, SSDs are more prone to data loss than mechanical hard drives during sudden power outages. While file system logging and data recovery can help, relying on software solutions is not reliable.

A hardware solution is needed, and that's where Power Loss Protection (PLP) for SSDs comes in.

## What is SSD Power Loss Protection?

SSD Power Loss Protection is a technology designed to protect data from being damaged or deleted from an SSD when power is suddenly cut off. Sudden power outages can be caused by power cuts, voltage surges, or the power cord being accidentally unplugged from the electrical outlet.

In the event of a sudden power failure, SSDs with PLP protect data by providing power long enough for data to be properly stored and logged. The emergency charge comes from the charged supercapacitors on the SSD. Charging time lasts only a very short time (milliseconds) but is enough to transfer gigabytes of data from DRAM to NAND.

## What are the benefits of SSD PLP?

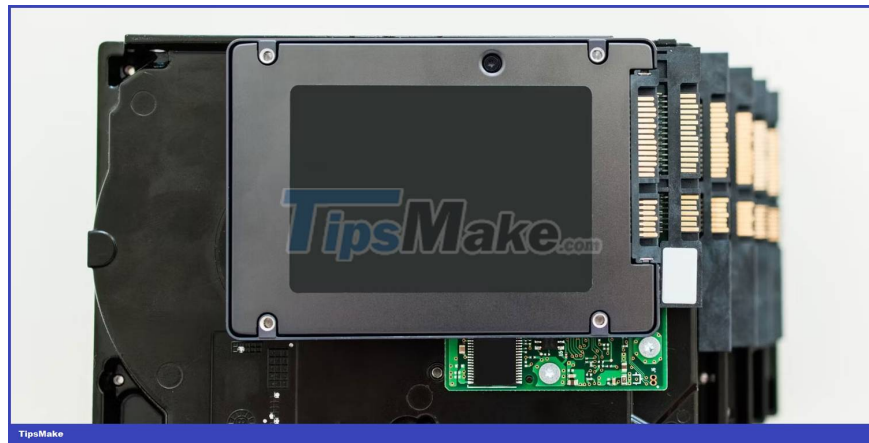


The main benefit of having PLP on an SSD is that it reliably protects data in the event of a sudden power failure. While this may not be a big deal for personal computers, data protection is essential for businesses and organizations that store valuable information on servers. Without a PLP, a business can lose critical data needed for day-to-day operations, causing financial losses and damaging the company's reputation.

Besides preventing data loss and corruption, SSDs with PLP also improve the overall reliability and lifespan of the SSD. By ensuring that data is safely transferred to NAND flash memory, PLP maintains the health of the SSD by preventing problems that could lead to SSD failure in the long run. So, by reducing SSD failures, you're also reducing wear and tear, thus helping SSDs last longer.

Before explaining how PLP works, let's first talk about how a typical SSD works and how data can be lost or damaged during a power outage.

## How do PLP SSDs work?

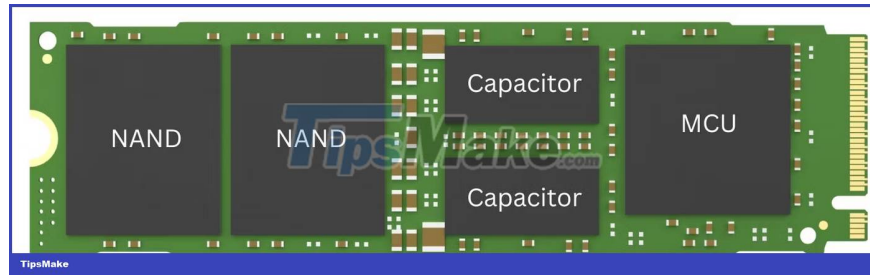


SSDs use two types of memory in their circuit: DRAM flash memory and NAND memory. NAND flash memory is a type of permanent memory used for long-term storage. On the other hand, on-board DRAM is volatile memory, used to store data before saving to main NAND memory.

During normal operations, the built-in DRAM temporarily stores frequently accessed information before the data is stored on NAND flash memory. When the power is suddenly cut off from the SSD, the data cached on the DRAM will be lost because it is a type of volatile memory that requires constant power to store information. Loss of power while transferring files to NAND memory will also cause the file to be corrupted due to the file being shredded or incomplete.

Other ways to avoid sudden loss of power to SSDs include backup battery packs (BBUs) and uninterruptible backup power. However, these are external solutions that need to be purchased separately.

A neater and more cost-effective solution (depending on needs) would be to use an integrated PLP SSD, incorporating the use of tantalum capacitors. These special capacitors can hold enough charge to power an SSD for a short time, typically lasting between 20–40 milliseconds, which is enough to directly transfer several gigabytes of data (depending on data). model) to NAND flash memory.



PLP SSDs use capacitors instead of regular batteries for several reasons.

First, capacitors can rapidly release their charge into the SSD long before the component reaches its idle voltage. Capacitors also have a high energy density, allowing them to hold enough charge in such small packages. Finally, capacitors can also operate in harsh environments where high temperatures can be a constant factor. While batteries can power SSDs for longer, their large volumes, low life cycles, and slow charging and discharging rates are more suitable for portable power stations or uninterruptible power supplies.

PLP SSDs sometimes include an additional microcontroller (MCU) for additional features such as enhanced power loss protection, additional security, and various customization options.

## What is the limitation of SSD PLP?

Whether you're purchasing an SSD with PLP for your corporate cluster or personal storage, it's important to know that a PLP SSD should only be considered an extra layer of protection against possible data loss and corruption. Here are a few limitations of SSD PLP that you should keep in mind:

1. **SSD PLP protects data only during power failure or sudden power failure** . If a voltage surge occurs, it is likely that the SSD circuit will be damaged. At that point, no data is safe. A surge arrester, AVR or even a UPS should be added to the system if stored data is of the utmost importance.
2. **PLP's backup power is limited** . Since the power bank only lasts a few milliseconds, large files may not be successfully transferred to NAND before the power bank expires. In this case, the SSD will still rely on the file system log to recover lost data.
3. **Your system may not support PLP** . While most PLP SSDs have the same connectors and form factor, not all SSDs with PLP are compatible with every system. This is especially true for more advanced PLPs with integrated MCUs. You must check compatibility before purchasing.
4. **PLP SSDs can be expensive** . While the typical 20%-30% increase in price for an SSD with a PLP isn't a big deal, buying dozens of them for a server can be very expensive. Purchasing a UPS may be a better solution for large operations on a tight budget. For small-scale and personal use, the cost of one or several SSDs with PLP capabilities will be a better solution if you are only concerned with protecting the stored data.

## SSD Power Loss Protection is awesome!

SSD Power Loss Protection is an elegant solution to keep data safe in the event of a sudden power failure. In addition, SSDs with PLP offer more benefits such as longer lifespan, better reliability, and peace of mind. While these SSDs are typically used for enterprise applications, and consumer-grade SSDs have a harder PLP to find, if they're available in your area, you might want to buy one for yourself.

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