ZeusRAM Solid-State Drive

Frequently Asked Questions

HGST
*a **Western Digital** company*

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Q: What is ZeusRAM?

A: ZeusRAM is a low latency (under 23us) wear-resistant SAS SSD. It supports dual 6Gb SAS ports, provides persistent 8GB capacity for write intensive applications such as non-volatile Storage (NVS) and Caching and comes in standard 3.5inch drive form factor.

Q: Where is ZeusRAM used?

ZeusRAM, an enterprise class wear-resistant RAMDrive, is targeted for high write transaction oriented environments requiring fast write commit capabilities to speed up end user application throughput of NAS and unified storage appliances. It is used in Unified Storage Appliance for Metadata Store and/ or logging for fast write commits. It is also used in de-duplication appliances for indexing and check-pointing and in continuous data protection (CDP) appliances. ZeusRAM is also popularly used as ZilCache in ZFS based appliances.

Target Applications – Write Intensive

NAS/ File Based Appliances
- Acceleration Modules (PAM)
- Used for holding file system metadata
- File system log data

Unified Storage Appliances
- Tier 0+ Storage for fast write commit
- Holding hash tables/ indexes for database appliances
- Log data

Purpose-built Application Appliances
- Mission critical applications where flash is not suitable due to large number of writes
- De-dupe Appliances
- Continuous data protection
- Replacement for NVRAM modules

Q: How is ZeusRAM different from other SSDs?

A: ZeusRAM is unique and is different from other SSDs because it merges the benefits of DRAM, i.e., low latency and symmetric read and write performance, and Flash, i.e., persistence or ability to retain DRAM data after scheduled and/or unscheduled power failures. ZeusRAM has built in supercaps that are used to backup DRAM data to Flash media during a power failure event.

Latency on ZeusRAM is an order of magnitude better than even the best SSDs on the market, under 23us, and it has unlimited write capability without danger of wear-out of flash media.

Q: What is ZeusRAM capacity?

A: 8GB

Q: How long does ZeusRAM hold data in a power loss event?

A: Unlike battery backed solutions that can only hold data for 24hrs- 72hrs during a power loss event, ZeusRAM uses supercap technology to back up all data to Flash media. Therefore, during a power loss event, ZeusRAM can hold data for virtually unlimited period of time.

Q: How long does it take ZeusRAM to backup data?

A: It takes 30secs to backup all DRAM data to Flash on ZeusRAM during a power failure.

Q: What data protection features does ZeusRAM support?

A: ZeusRAM has ECC protection on its DRAMs. ZeusRAM also has CRC as well as ECC protection on Flash media. In addition, ZeusRAM also uses advanced redundancy technique called Secure Array of Flash Elements, aka, S.A.F.E. to protect against NAND page, block or die level failures.

Q: How is super capacitor different from battery? Which is better?

A: Super capacity is very different from battery technology. Super cap technology is a capacitor based technology that is used to provide back-up energy in the absence of primary energy source, such as during a power failure event.

SuperCap is a better option compared to battery because:

- **Virtually unlimited data retention duration after power failure:** Batteries can only hold charge for 24hrs – 72hrs. Supercaps can be used to hold charge so that data is written to persistent flash media hence retaining data for virtually unlimited time.

- **Faster charge up time:** Batteries can take 6 - 10hrs to charge up as opposed to Supercaps that charge up in a matter of minutes. ZeusRAM charges up in 6mins.

- **5 yrs lifetime & no maintenance required:** Batteries have a life of 1-2yrs and need to be replaced in the field resulting in higher cost of deployment. In addition, batteries also need maintenance, i.e., periodic conditioning cycles that also adds to the cost of deployment of batteries. Supercaps have a 5-7 yrs lifetime and don't require any scheduled maintenance, i.e., no maintenance costs.

- **No Special Regulatory Requirements:** Batteries consist of hazardous materials and need to be disposed safely, i.e., it costs money to dispose off batteries. In addition, batteries also have transportation restrictions regulated by IATA (International Air Transport Association).

Q: Are there any shipping/ transportation restrictions to ZeusRAM?

A: No, there are no shipping / transportation restrictions on ZeusRAM. Supercaps on ZeusRAM have been cleared by IATA for transportation.

Q: What is ZeusRAM's operating temperature?

A: 0-60°C

Q: Can I get ZeusRAM in 2.5inch form factor?

A: ZeusRAM currently only supports 3.5 inch form factor.

Q: What is ZeusRAM's warranty period?

A: 5 yrs

Q: How long does ZeusRAM take to do a cold power on?

A: ZeusRAM responds to non-read/write commands within two (2) seconds. If supercaps are fully charged, then typically ZeusRAM is ready within 20 seconds. If the supercaps are completely discharged, then it takes ZeusRAM 6-8mins to be ready from cold power on.

Q: Will you make it in a PCIe version? Why SAS?

A: Currently, ZeusRAM only supports a 6Gb SAS interface, no PCIe version. SAS is primary interface to enable shared memory architecture, wherein, ZeusRAM can be placed in a standard JBOD along with other HDDs and/or SSDs and is accessible by multiple hosts. ZeusRAM supports SAS hot plug capability for easy removal and/or maintenance. In addition, SAS interface allows for fast and easy integration of ZeusRAM into customer applications.

Q: Is there a limit to the number of times the supercaps can be turned on and off (i.e. number of power cycles allowed)

A: ZeusRAM specification states that it can support 1 power failure, every hour for 5 yrs. That is a total of 43,800 power cycles.

Q: Will there be smaller versions available?

A: ZeusRAM currently only supports 3.5 inch form factor.

Q: What interfaces can you support?

A: ZeusRAM supports dual ported 6Gb SAS interface. It is backward compatible to 3Gb SAS also.

Q: What happens to the device when supercaps fail?

A: ZeusRAM has redundant supercap protection circuits. If there is problem with the primary supercap protection circuit, the backup circuit still provides protection against power failure events. However, if there is a supercap failure then, ZeusRAM provides as S.M.A.R.T status regarding the hard failure and transforms into a read-only device so that host can read all the data from ZeusRAM and store it to another persistent device.

Q: How long does it take the supercaps to charge?

A: From a completely discharged state, supercaps charge up in 6-8 mins approximately. However, supercaps can take upto 24hrs to completely discharge. Therefore, after a brown out or regular power cycle event, ZeusRAM is ready within 20-30sec.

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