

Memoright Insight

Software and Hardware Protective Design

with SLC solutions

Preliminary Version

Version 0.5

Jan. 2011

Overview

This document presents Memoright power failure handling, regarding its NAND Flash storage solutions.



Change History		
Rev.	Update	Updated
0.5	Initial release	Jan 2011

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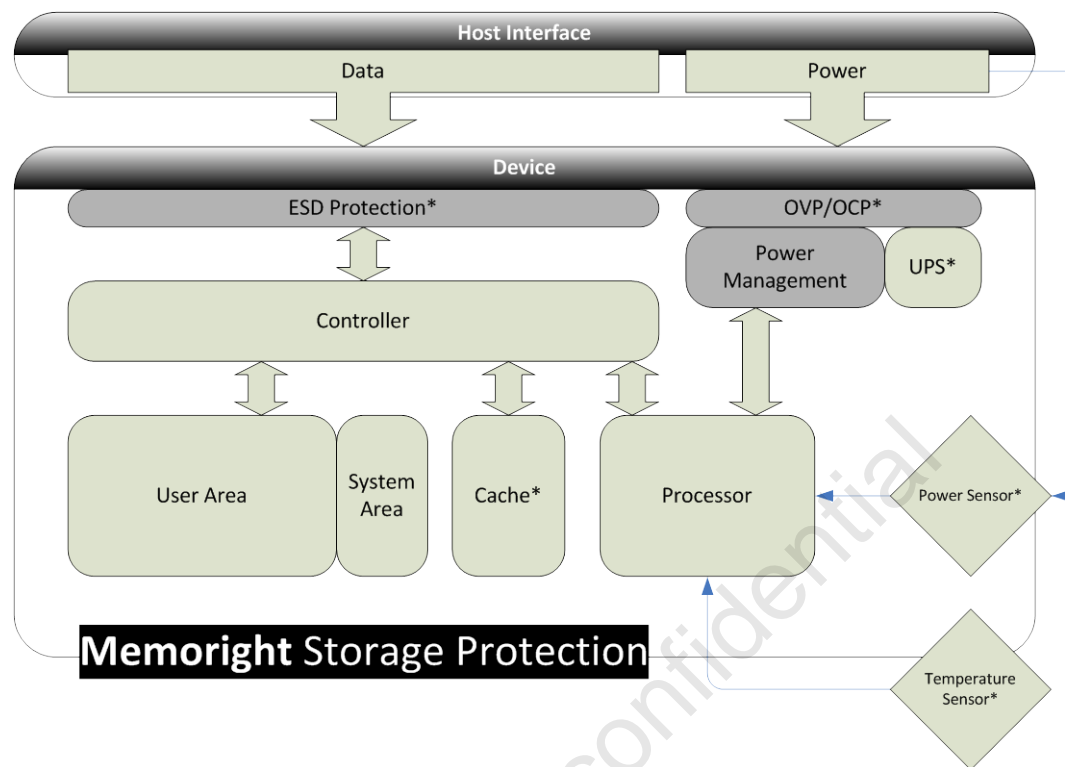


Figure 1: Semi-industrial test: high temp (+75°C)

All Memoright industrial grade products are screened over and over, through very strict stress tests to insure functionality under the harshest environment.

Basic procedures include passing environmental test and verify, among other things, drive functionality in their temperature operating range and with uncontrolled power removal.

Memoright preventive blueprint



*: implementation may vary from one product to another

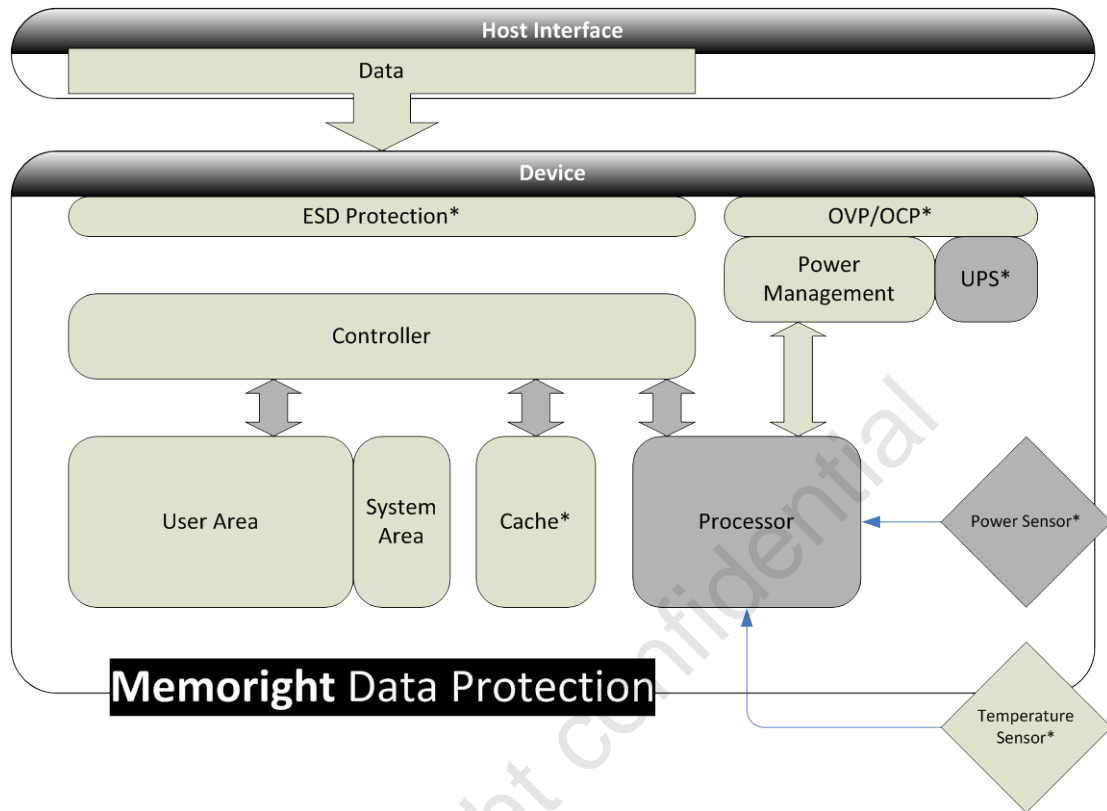
Figure 2: Memoright hardware protective design

From its experience in conceiving storage solutions for industrial or defense applications, all Memoright product families integrate strengthened design to insure extensive protection to all components, electrical and physical.

Very strict internal stress tests include hipot (high potential), power cycling (PCT) burn in (BiT), to qualify Memoright solution, layout and assembly.

Beside Over current (OCP), Over Voltage (OVP), Electrostatic Discharge (ESD) protections, power regulator and management block (PWM) are implemented whenever necessary, to feature a stable, coherent and efficient electrical environment.

Memoright in-drive UPS



*: implementation may vary from one product to another

Figure 3: Memoright power removal containment procedure

Alternative power supply option is available on special range of Memoright storage solutions. This additional feature allows normal operation to complete in case of unexpected power removal.

When input voltage drops below a certain lower threshold, the ARM processor is notified and will lock the drive to maintain data integrity.

Last transmitted data is flush back thanks to the in-drive Uninterrupted Power Supply (UPS).

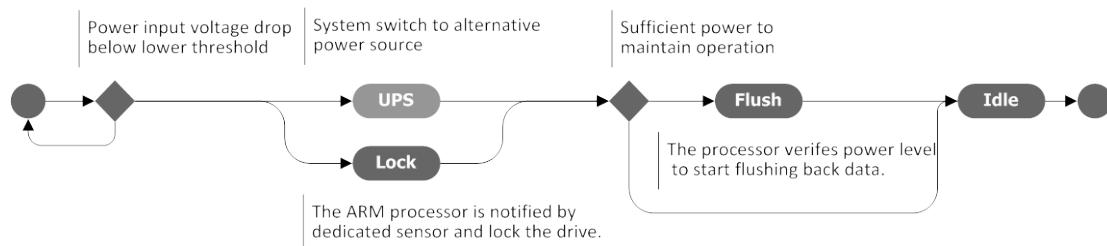


Figure 4: Power Failure Protection flow

Memoright failover system

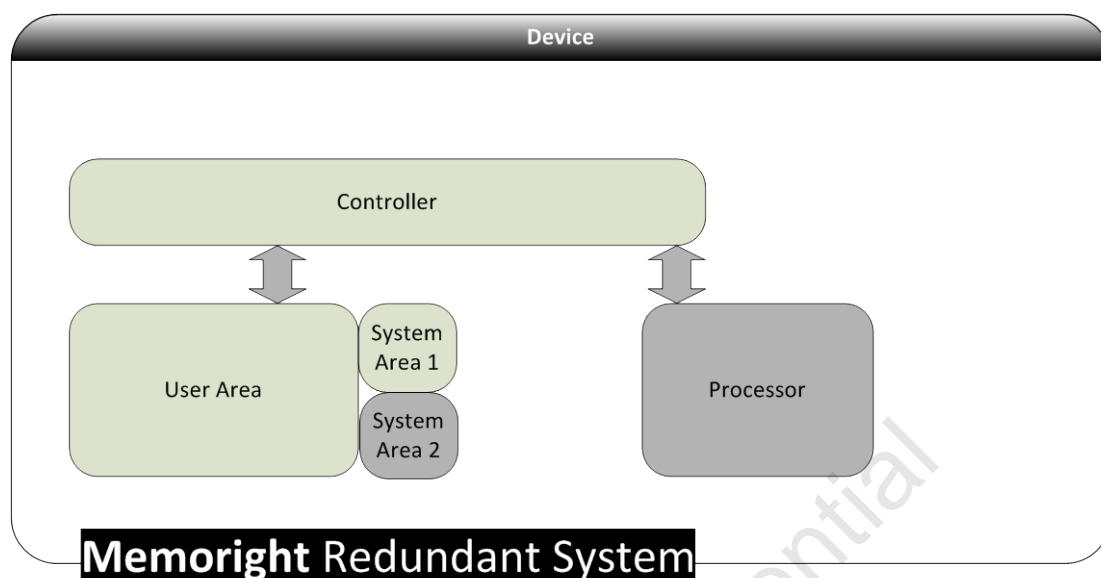


Figure 5: Memoright power failure backup system

For device without in-drive UPS, when input voltage drops below operational value, data corruption is very likely to happen. In worse case scenario, it might happen that the storage is unable to recover and even impossible to operate (fail to be identified by the host system).

As most NAND Flash solutions, instead of an actual physical CHS (cylinder/head/sector) architecture, there is a Logical to physical mapping.

Most of the time, after a crash, this map table is corrupted. This can lead to integrity loss of the system area (firmware, spare block, etc.).

Memoright Redundancy System, with multiple copies of the firmware and backup map table will prevent such uncoverable hard failure occurrence. On-chip power regulator would also greatly improve the safety of data transfer under unstable power supply.

Power Cycling Test (PCT)

Power cycling burn in test is a standard requirement for reliability and endurance. Two major concerns are power removal and cold boot. Depending on product architecture (in-drive UPS, cache, firmware, interface, form factor), different scenario will be iterated exhaustively for the stress test.



Figure 6: Memoright 1.8" PATA ZIF & 2.5" SATA SSD burn in

Basic operations would consist of:

- Read,
- Write,
- Flush,
- Compare,
- Forced power removal, etc..



Figure 7: Memoright Power Cycling Control Management

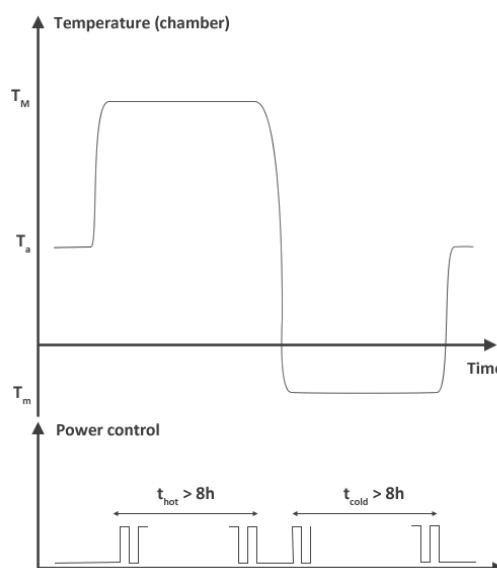


Figure 8: Stress test temperature profile

GTR Series Industrial SSD

DVT/MP test plan summary

- Drives are loaded at $T_a = 20^\circ\text{C}$ (or room temperature).
- 8 hours High temp burn in
- Chamber will reach $T_M = 90^\circ\text{C}$ within half an hour.
- 8 hours High temp burn in
- Chamber will reach $T_m = -45^\circ\text{C}$ within an hour.
- 8 hours Low temp burn in
- Return to room temperature.

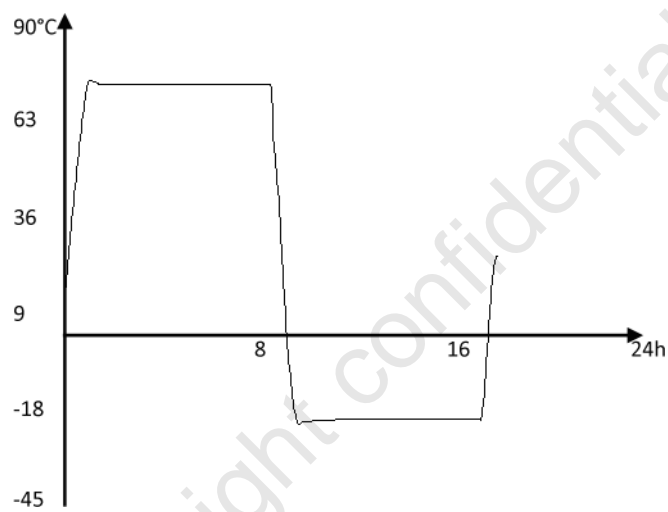


Figure 9: Chamber Temperature log

Sales and technical support

Contact Memoright SSD Design Center for data sheet, documentation, customization for specific application and technical support.

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