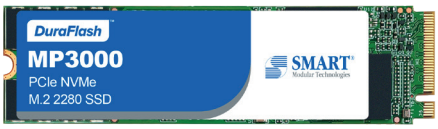
DuraFlash™

CASE STUDY

Case Study – Advanced SSD in Industrial Computing Application

Challenges

- Response to potential power losses with migration to embedded computers
- Power loss protection and controller firmware were not robust enough to handle voltage fluctuations, falsely triggering SSD into power loss mode
- Compliance with extensive global regulatory rules



Introduction

As more and more industrial applications migrate to intelligent embedded computers for performance and efficiency gains, the need for dealing reliably with power loss has increased significantly. Blackouts, brownouts, and even transients in the power grid or the local supply to the system can cause data loss -unacceptable in most situations, such as automotive applications, health care, and a variety of factory automation environments. For mission-critical applications, the power loss protection must also protect in-flight data, which is data that has been written to the SSD, but is still in volatile cache (such as SRAM or DRAM) and has not been fully written to the NAND Flash inside the solid state drive.

The Challenge

One of SMART Modular Technologies' long-time customers, a major manufacturer of industrial PCs (IPC), faced a problem where voltage fluctuations from the power supply in their customers' factory automation equipment falsely triggered the existing SSD to go into a power-loss, data-protection mode causing process terminations and cache flushes designed to preserve data in a true power-loss event. Some cases falsely triggered the power loss sequence, wasting considerable time and led to disruptions in manufacturing. When the power supply voltage oscillated back-and-forth, quickly and randomly, a typical power loss protection circuit and controller firmware implementation could not handle the internal operations correctly. These oscillations can lead to data loss, which in some cases, can cause the drive to cease functioning.

SMART and its customer collaborated on the solution for an SSD that provided a more robust and sophisticated power loss protection scheme. The solution also needed to be impervious to the multitude of transient types in a high-endurance, high-capacity, industry-standard form factor in multiple storage capacities that supported a standard PCIe interface and NVMe protocol. The SSDs also had to perform correctly and robustly over an extended lifetime. Finally, this storage device would have to comply with an extensive list of global regulatory requirements.

SMART Modular's engineering team came back with a solution using M.2 2280 PCIe NVMe SSDs. These drives would provide the customer with a high performance, high endurance design and ideal for industrial networking, telecom, and data communication applications requiring reliable internal storage. The five-year, one drive-write-per-day (1 DWPD), JEDEC enterprise workload endurance rating for the drive would be more than sufficient to meet the IPC application's endurance requirements for robust performance over the drive's lifetime.

SMART®
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Product Features

- SafeDATA™ Technology: Proprietary power-loss data protection technology using on-board design elements
- Endurance: 5-year, one Drive Write per Day (1 DWPD), JEDEC enterprise workload endurance rating
- Capacity: 240GB to 1920GB
- Form Factor: M.2 2280
- Interface: PCIe NVMe
- Grade: Industrial (-40 °C to 85 °C)
- Compliance and Certifications: CE, UL, BSMI, CB, KCC, FCC, VCCI, RoHS, REACH,WEE

The Solution

After thorough analysis and research, SMART Modular's engineering team came back with a solution using M.2 2280 PCIe NVMe SSDs.

To overcome the challenging test cases of the power supply voltage fluctuation scenario, SMART worked with the customer to characterize the host system power supply stability and re-designed the power-on and power loss monitoring circuits. To help achieve this, they optimized the algorithm in firmware to eliminate failures with this usage model and to recognize transient fluctuations without triggering false power loss data protection protocols.

Besides meeting the workload needs, the industrial SSDs SMART recommended come equipped with SMART's proprietary SafeDATA™ power loss data protection. SMART Modular's trademarked proprietary power loss data protection technology utilizes tight integration and know-how of hardware design and firmware algorithms to safeguard the integrity of the data in a sudden power loss event and recognizes transient fluctuations without triggering false power loss data protection protocols.

The M.2 drives also provide the customer with a high performance, high endurance design, ideal for the industrial networking, telecom, and data communication applications requiring reliable internal storage. The five-year, one drive-write-per-day (1 DWPD), JEDEC enterprise workload endurance rating for the drive is more than sufficient to meet the IPC application's endurance requirements for robust performance over the drive's lifetime.

The M.2 SSD family also provides options for customers, available in an industrial temperature (-40°C to 85°C) version from 240GB to 1920GB that meet the varied needs of applications with different storage capacities. In addition to holding all the needed certifications, SMART also worked with the manufacturer to provide a custom model number ID string for the IPCs and custom labeling.

The IPCs are currently being built to specification for end users with SMART Modular's industrial drives installed in each machine.

SMART® Modular Technologies

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