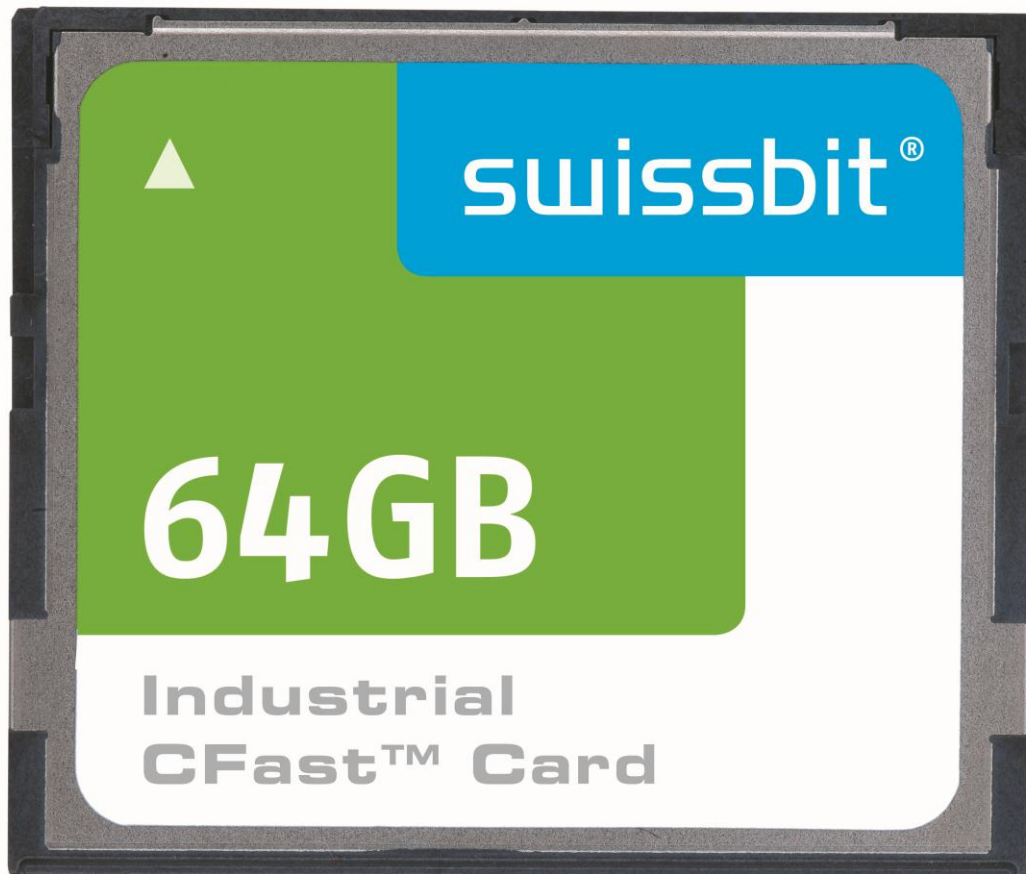


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F-240 Series CFast Card Power Fail Protection

White Paper

BU: Flash Products
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1 Power Fail Protection

1.1 Introduction

In many applications, unintentional power loss is critical and can occur frequently. Thus, it is necessary to implement mechanisms that prevent from non-working devices, such with firmware damage or undefined data states.

This document describes the internal power-fail management mechanisms of F-240 Cfast cards.

1.2 F-240 internal power fail management features

- Proven power-fail robustness, integrity of firmware and firmware management data
- Twin-Concept ensures data integrity and minimal loss of data
- Safe Flash Handling feature reprograms last written Flash-pages at next power on

1.2.1 Proven power fail robustness / Twin Concept

Upon a sudden power fail, the card internal controller is reset and all communication to the flash is stopped (including write operations).

The controller keeps a log of recent flash transactions and will check the ECC of the last written sectors at the next power on. If the last written data instances are corrupt, the controller will recover the previous instances. If a write operation was active at the very same time as the power loss occurred, this data might be lost. As the previous data instances are always kept until the new data is confirmed to be valid, a so-called twin of the active block can recover the last valid state.

Summary:

- ⇒ The controller keeps a log of the most recent flash transactions
- ⇒ If the last data of this log is identified corrupt, the controller will recover the previous valid entry
- ⇒ If a write operation was active at power loss this data might be lost
- ⇒ Original data twin of the active block is kept, allowing to recover the last valid state of data

1.2.2 Safe Flash Handling Feature

Newer flash die shrinks (4x nm technology or smaller structures) may program flash-pages weakly if the power is disappearing during program. This may generate pages that are readable only once and returning ECC errors on later read attempts.

In fact, it is problematic if such an unsafe programming has happened to e.g. a firmware-management block. This might cause loss of important firmware management data and as a result the drive may not work properly anymore.

- ⇒ Safe Flash Handling refreshes firmware management data and user blocks at every power-on sequence of the drive, ensuring sufficient charge of the flash cells.

1.3 Power-off recommendations

1.3.1 Cache of the operating system

Operating systems may cache file system data before they are sent to the SSD. At a sudden power fail event this data is lost.

- ⇒ If sudden power fails are likely to occur in the application, the operating system write cache should be disabled.

For detailed description see: Application Note Design In Guide

1.3.2 File system inconsistencies

Old file systems may be getting inconstant due to sudden power fail, because in FAT1 and FAT2, directory and files were written sequentially. After a sudden power fail it should be checked and repaired (e.g. with chkdsk or scandisk).

- ⇒ After a sudden power fail, the file system should be checked and repaired.

For detailed description see: Application Note Design In Guide

2 General Recommendations

Please study our "Application Note Design In Guide" in order to optimize your application for SSD usage. This guide contains helpful regarding OS settings, file systems, partitioning and cluster size.

3 Document History

Table 1: Document Revision History

| Date | Revision | Details |
|-----------------|----------|---------------|
| 16-January-2015 | 1.0 | First release |
| | | |

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