



# BENEFIT (→) OF ADOPTING SANDISK'S HIGH- ENDURANCE OEM-GRADE microSD™ CARDS

**SANDISK™**

for video surveillance camera  
manufacturers and Industrial/  
IoT customers

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## Introduction

Sandisk, as a broad-range manufacturer of SD and microSD cards, offers multiple product lines and sub-brands to serve different market verticals. In general, SD cards produced by Sandisk are known for consistent quality and reliability. Models not designed with high-endurance NAND chips are primarily intended for balanced, non-write-intensive applications such as digital cameras, gaming consoles, and smartphone memory expansion. The internal firmware of the card controller is mainly optimized for high performance to meet specific speed class requirements. Consumer SD cards targeted at the consumer market typically do not include specified write endurance ratings.

## Commercial-grade product considerations

Sandisk also offers premium microSD cards within the commercial product line up. These products are primarily aimed at users of video surveillance cameras who seek a more reliable solution, enabling a better user experience—meaning reduced risk of recording outages and less frequent replacement of worn-out cards.

The write endurance specification for these video-friendly commercial microSD cards is typically expressed in thousands of hours of video recording at a specific bit rate, rather than in total bytes written (TBW). This approach makes the endurance rating easier to understand for non-technical users.

Consumer-grade products of this type do not include a defined health monitoring register, as such functionality is neither specified by the SD Association nor commonly implemented as a method to report remaining endurance. Consequently, video surveillance cameras have very small means to estimate the remaining operational lifetime of a consumer-grade SD card. The remaining lifetime is estimated by tracking operating hours and written data.

Certain consumer product models may be discontinued when consumer demand declines. Additionally, the bill of materials—including the controller, firmware, and NAND technology—can change over time without prior notice.

## Commercial OEM-grade Industrial and Video microSD cards

To meet the requirements of various video surveillance camera manufacturers developing products for professional use and security-sensitive environments, Sandisk has introduced three main product lines that are currently prominent in the OEM distribution channel.



**IX QD332 (P/N SDSDQAF3-###G-I)**  
8GB, 16GB, 32GB, 64GB, 128GB<sup>1</sup>  
capacity points, designed with 15 nm  
planar NAND MLC (2-bits per cell), up  
to 3K P/E cycles capable.



**IX QD342 (P/N SDSDQAF4-###G-I),**  
16GB, 32GB, 64GB, 128GB, 256GB<sup>1</sup>  
capacity point, designed with BiCS3  
64-layer 3D NAND TLC (3 bits per cell)  
technology, up to 3K P/E cycles capable.



**VD QD131 (P/N SDSQAS5-####),**  
256GB, 512GB, 1TB, 1.5TB<sup>1</sup> capacity  
points, designed with BiCS5 112-layer  
3D NAND QLC (4-bits per cell)  
technology, up to 1K P/E cycles capable.

## Advantages of OEM-grade industrial cards

### **Designed with Industrial grade wafers, offering FIT/MTTF**

A specific qualification report is issued for each product showing the qualification flow the product has undergone. A reliability demonstration test shows how FIT/MTTF has been estimated.

### **Designed to help maximize write endurance and data-retention with optimized ECC (Error Correction Code) settings in the controller, wear-leveling, read-refresh algorithms, and sudden power-loss data protection**

By contrast consumer-grade cards are often optimized for read and write performance instead.

### **Defined bill-of-material (BOM)**

A product is built using the same controller and NAND technology and firmware version. In case of any change, a product change notification is issued to all customers. Consumer grade cards may be affected by unannounced changes to the product configuration, preserving the same specifications, brand and device model naming. A surveillance camera platform might behave unexpectedly when a new microSD card BOM is used.

### **Defined endurance in TBW (total bytes written) and P/E cycles, in combination with vendor-specific health status register, reporting the percentage of wear-out**

This allows the user to plan a certain card capacity usage depending on the bit-rate and hours of operations. The exact endurance remaining can be measured and read out from the health status register, to plan for microSD card replacement. Thus, enabling proactive routine maintenance to help ensure service continuity instead of reactive maintenance when integrated cards approach their endurance limits.

### **Sandisk provides software tools for Linux® platforms for implementing the health status register read-out**

Easy implementation of the health status register read in Linux-based cameras.

### **Host Lock feature, with forced-erase disable feature (COP-SDA feature)**

This protection technique described in the SD-Association specification allows the user to lock the card when not used with a predefined host-cameras. The paired valid host can unlock the camera by issuing a password unlock command. In case the end-user tries to read the microSD with a non-valid host, the card content is configured to help prevent erasure by unauthorized hosts. Consumer cards only support the standard content-owner protection feature (COP-erase) leading to secure erase of the content to help avoid unauthorized users from retrieving it. Industrial cards contain a specific command flow to disable COP-erase, if the user prefers.

### **OTP String and Programmable CID**

These vendor specific features allow the OEM camera manufacturer to write certain identification strings unique to each card or for a group of cards. This feature can be used for enhanced security features or for forcing the end-user to

only microSD cards customized by the camera maker.

### **Optional white-label cards, in bulk-shipments in trays and jewel plastic-case**

This allows the OEM customer to optimize the unboxing and the sorting of large quantities of SD cards to be used for bundling cards with new cameras. The OEM camera manufacturer can also repack the card with customized packaging to resell the product under a different brand. Consumer cards are sold in individual packages with no customization options. Bulk-shipments in tray are not available for consumer cards.

### **Support during product validation for OEM customers, with SD card workload analysis at system level**

This approach helps video surveillance camera software designers narrow down usage patterns influenced by the chosen file system, such as cluster size, the most frequent data chunk sizes used when saving video streams, journaling options, and other kernel and file system tuning parameters. The goal is to determine the write amplification for each workload model.

Write amplification factor (WAF) is the ratio between the amount of data written by the host and the actual number of bytes written to the NAND flash memory. This metric provides a systematic method for estimating the expected lifetime of a specific card capacity when used in a particular camera model, with a given file system configuration and a defined number of video streams recorded at a specific bit rate.

Low-bit-rate streams, such as metadata streams, can potentially impact write amplification by interfering with the sequential writing of high-bit-rate data chunks, leading to increased fragmentation and inefficiency.

Such analysis is not feasible for consumer cards, sudden changes in the bill of materials (BOM) and firmware versions can impact prior optimizations.

### **Failure analysis service.**

This service helps to narrow down potential recurrent failure mode in the field and helps ensure they are not generated by systematic harmful usage of the card. Without any verification of the root cause of failed units, higher unexpected failure rates may happen in the field.

### **SD card firmware update features**

This allows Sandisk to provide new firmware versions to improve the card features and fix certain firmware marginality discovered during the life-cycle of an industrial card model (maintenance release).

### **Defined longevity and end-of-life (EOL) notifications.**

Sandisk aims to provide at least 6 months' notice of EOL for commercial cards. This can help to plan the transition to a different product family and to plan last-time-buy (LTB) quantities. Consumer cards are typically terminated without any notification to end users.



## Conclusions

Due to these considerations, the IX QD332, IX QD342, and IX QD131 industrial microSD cards from Sandisk are well-suited for the video surveillance camera ecosystem of OEM customers.

While high-quality commercial cards may be suitable for occasional use, large-scale professional installations require a more systematic approach to enable a more seamless user experience. Industrial and Video high-endurance microSD cards offer more flexibility for health monitoring, enable proactive maintenance, and help reduce the risk of recording outages.

Additionally, the ability to customize identification strings, packaging, and delivery options for industrial cards simplifies logistics for creating bundled kits and supports the resale of microSD cards rebranded by OEM camera manufacturers.

Features such as customized identification strings and the lock function also enhance software-level security.

The business potential of selling accessories tailored to specific surveillance camera models is further strengthened by the packaging options and features available with OEM Industrial High-Endurance cards.

<sup>1</sup> 1GB=1,000,000,000 bytes. 1TB=1,000,000,000,000 bytes. Actual user storage less.

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