Factsheet 01.000
January 2022

Features

- **Industry Standard Interface**
  - SD Specification Version 6.10 compliant
  - Supports secure digital (SD) and serial peripheral interface (SPI) protocols
- **Performance**
  - Class 10 Speed performance rating (based on SD 6.10 Specification)
  - Bus speed mode (using 4 parallel data lines)*
    SDR12: 1.8V signaling (up to 25 MHz) up to 12.5MB/sec
    SDR25: 1.8V signaling (up to 50 MHz) up to 25MB/sec
    SDR50: 1.8V signaling (up to 100 MHz) up to 50MB/sec
    SDR104: 1.8V signaling (up to 208 MHz) up to 104MB/sec
    DDR50: 1.8V signaling (up to 50 MHz, sampled on both clock edges) up to 50MB/sec
    *timing in 1.8V signaling differs from that of 3.3V signaling
  - Sequential data read / write:
    Up to 95 MB/s / Up to 85 MB/s
    (measured using 128 KByte transfer size)
- **Power Management**
  - 3.3V power supply
  - 2.7V ~ 3.6V operating voltage range with 2 Type signaling (1.8V and 3.3V)
- **Power Consumption**
  - Active current: < 400 mA
  - Standby current: < 1 mA
- **ESD Protection**
  - +4KV/-4KV (contact pads)
- **Reliability**
  - Mean Time Between Failures (MTBF): More than 3 million hours
- **Data Protection**
  - Content Protection for Recordable Media (CPRM) support (optional)
  - Password protection (optional)
- **Built-in ECC**
  - Uses advanced bit error detection and correction optimized for 3D NAND
- **SSD Lifespan Monitoring**
  - Enables SMART command-based alerts indicating the remaining useful product life and device information
- **NAND Configuration**
  - 1 bit per cell (SLC)
- **High Endurance**
  - 30K P/E cycles
  - Up to 1,829 TBW
- **Operating Temperature Range**
  - Industrial: -40°C to 85°C
- **SD and microSD Card Form Factors**
  - SD card: 32 x 24 x 2.1 mm
  - microSD card: 15 x 11 x 1.0 mm
- **Capacity**
  - High Capacity SD / microSD Card (SDHC / microSDHC): 16GB, 32GB
  - Extended Capacity SD Card / microSD Card (SDXC / SDXC): 64GB
- **All Devices are RoHS Compliant**

Product Description

The GLS93SR016G1 / 032G1 / 064G1 (SD form factor) and GLS93MR016G1 / 032G1 / 064G1 (microSD form factor) Industrial Temperature SD / microSD ArmourDrive™ EX Series (referred to as “SD/microSD ArmourDrive” in this factsheet) are high-performance, high-endurance flash memory cards. They combine 16, 32 or 64 GBytes of NAND flash memory with an advanced NAND controller in standard SD and microSD card form factors.

SD/microSD ArmourDrive is ideal for applications that require hot-swappable, small form factor data storage with high shock-resistance. SD/microSD cards are widely used in transportation systems, industrial automation, vending and gaming machines, medical computing, professional video and photo cameras, set-top boxes and point-of-sales (POS) equipment. These industrial removable memory cards surpass consumer memory cards in their security, reliability and ruggedness.

The NAND flash controller with built-in advanced NAND management firmware communicates with the host through the standard SD / SPI protocol. It does not require any additional or proprietary software such as the Flash File System (FFS) and Memory Technology Driver (MTD). The firmware effectively optimizes the use of NAND flash memory’s program/erase (P/E) cycles and minimizes write amplification.

SD/microSD ArmourDrive’s advanced NAND management technology improves endurance, enhances data security and helps prevent data loss during unexpected power loss events. This innovative technology combines robust NAND controller hardware error correction capabilities with advanced wear-leveling algorithms and bad block management to improve data reliability and significantly extend the life of the product.

1.0 GENERAL DESCRIPTION

Each SD/microSD ArmourDrive integrates a NAND flash memory controller with NAND flash in a multi-chip package. Refer to Figure 2-1 for the SD/microSD ArmourDrive block diagram.

1.1 Optimized SD/microSD ArmourDrive

The heart of SD/microSD ArmourDrive is the NAND flash memory controller, which translates standard SD / SPI signals into flash media data and control signals. The following components contribute to SD/microSD ArmourDrive's operation.

1.1.1 Microcontroller Unit (MCU)

The MCU translates SD/SPI commands into data and control signals required for flash media operation.

1.1.2 Power Management Unit (PMU)

The PMU controls the power consumption of SD/microSD ArmourDrive. The PMU dramatically reduces the power consumption of SD/microSD ArmourDrive by putting the part of the circuitry that is not in operation into sleep mode.

The Flash File System handles inadvertent power interrupts and has auto-recovery capability to ensure SD/microSD ArmourDrive firmware integrity.

1.1.3 Embedded Flash File System

The embedded flash file system is an integral part of SD/microSD ArmourDrive. It contains MCU firmware that performs the following tasks:

1. Translates host side signals into flash media writes and reads
2. Provides flash media wear leveling to spread the flash writes across all memory address space to increase the longevity of flash media
3. Keeps track of data file structures

1.1.4 Power Interrupt Data Protection

Power Interrupt Data Protection is a mechanism to help prevent data loss during unexpected power failure events. Enhanced data integrity is supported by the controller's advanced firmware during abnormal power loss.

1.1.5 Error Checking and Correction (ECC)

The ECC technology uses advanced algorithms to detect and correct errors, ensuring data integrity and extending the SSD lifespan.

1.1.6 Multi-tasking Interface

The multi-tasking interface enables concurrent Read, Program and Erase operations to multiple NAND flash media.

1.2 Advanced NAND Management

SD/microSD ArmourDrive's controller uses advanced wear-leveling algorithms to substantially increase the longevity of NAND flash media. Wear caused by data writes is evenly distributed across all available blocks in the device that prevents "hot spots" in locations that are programmed and erased extensively. This effective wear-leveling technique results in optimized device endurance, enhanced data retention and higher reliability required by long-life applications.

1.2.1 SMART Support

Industrial SD/microSD ArmourDrive memory cards use Self-Monitoring, Analysis and Reporting Technology (SMART) for automatic monitoring and reporting of the device's health and remaining usage life. With SMART support for advanced notifications, preventive actions can be taken by the host to minimize any irreversible data loss and ensure data integrity.

2.0 FUNCTIONAL BLOCKS

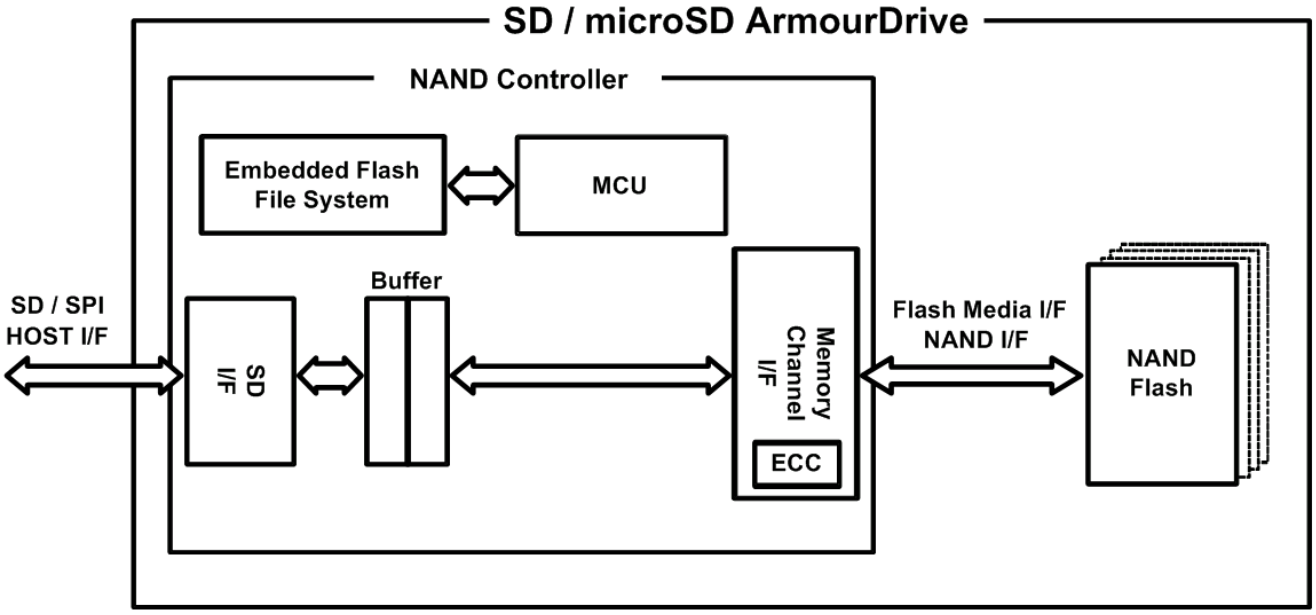
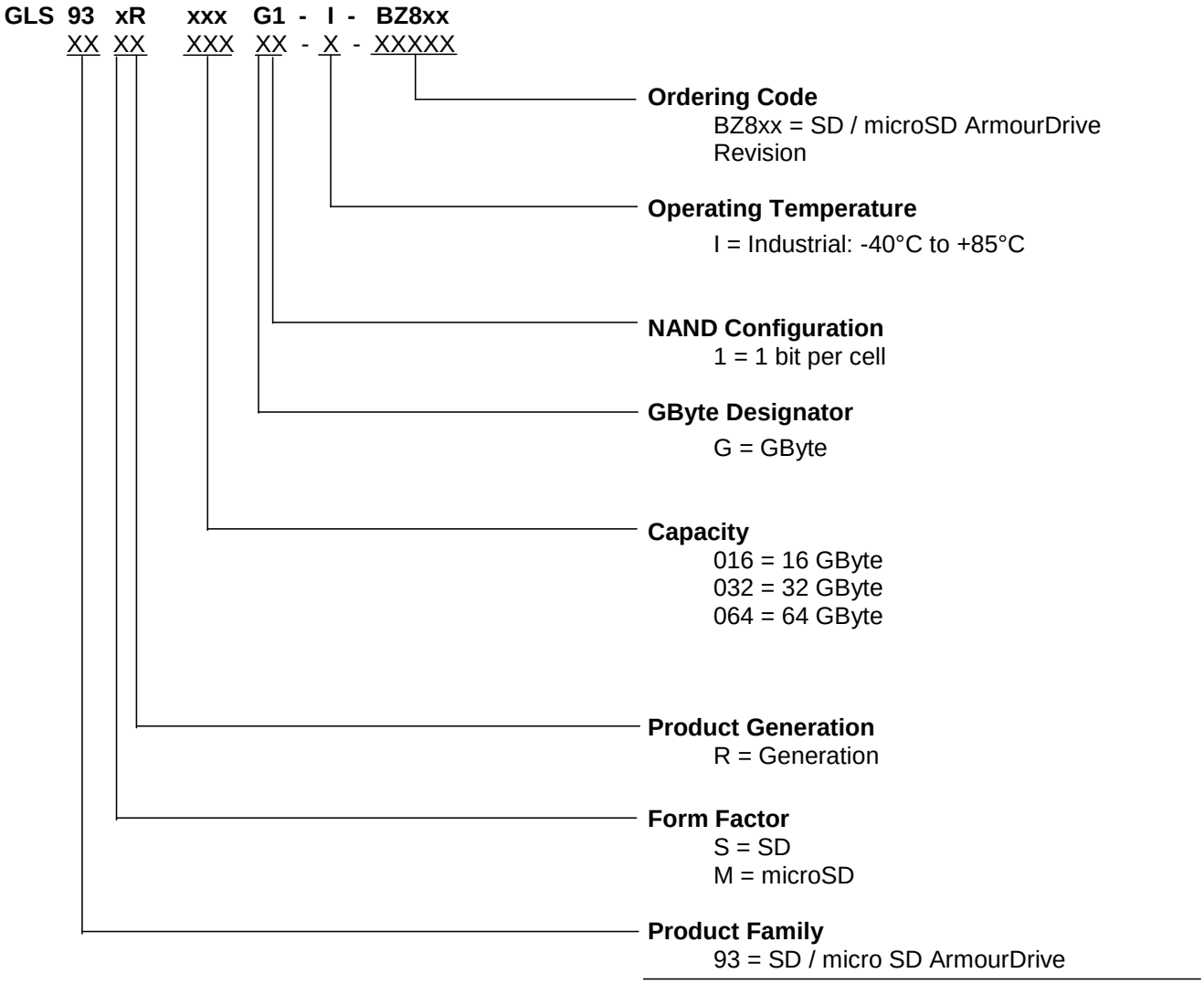


Figure 2-1: SD / microSD ArmourDrive Block Diagram

3.0 APPENDIX

3.1 Product Ordering Information



Valid Combinations

Valid product combinations are those that are in the mass production or will be in the mass production. Consult your Greenliant sales representative to confirm availability of the valid combinations and to determine availability of new product combinations.

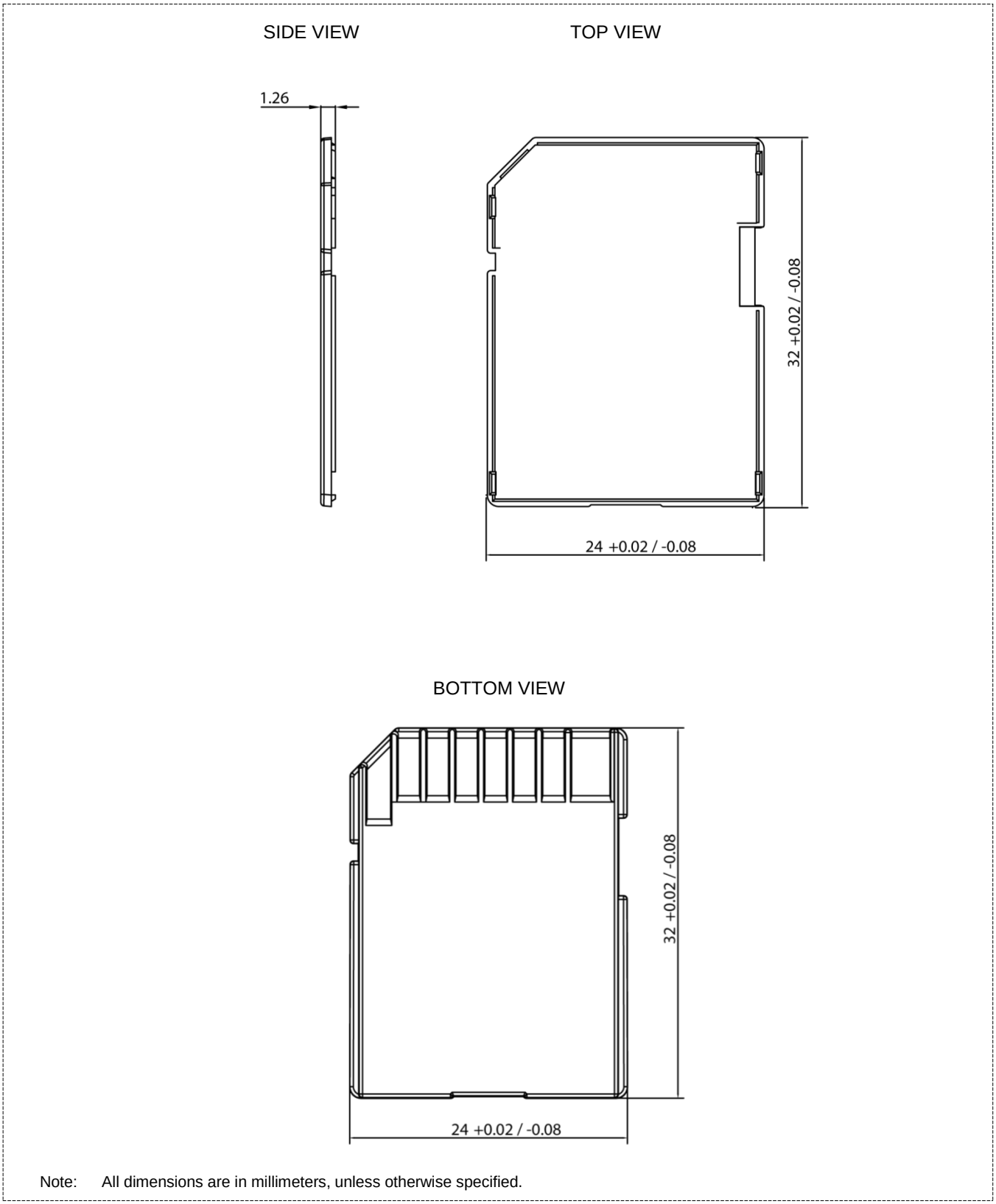
Table 3-1: SD ArmourDrive Product Valid Ordering Numbers

Capacity	Operating Temperature	Part Number	Form Factor
16GB	Industrial (-40°C to 85°C)	GLS93SR016G1-I-BZ809	SD card
32GB	Industrial (-40°C to 85°C)	GLS93SR032G1-I-BZ809	SD card
64GB	Industrial (-40°C to 85°C)	GLS93SR064G1-I-BZ809	SD card

Table 3-2: microSD ArmourDrive Product Valid Ordering Numbers

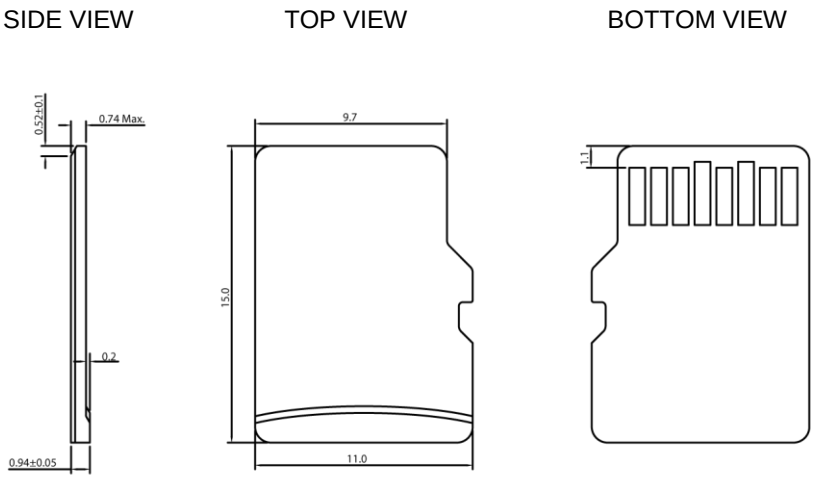
Capacity	Operating Temperature	Part Number	Form Factor
16GB	Industrial (-40°C to 85°C)	GLS93MR016G1-I-BZ808	microSD card
32GB	Industrial (-40°C to 85°C)	GLS93MR032G1-I-BZ808	microSD card
64GB	Industrial (-40°C to 85°C)	GLS93MR064G1-I-BZ808	microSD card

3.2 Product Diagrams



Note: All dimensions are in millimeters, unless otherwise specified.

Figure 3-1: SD ArmourDrive Dimensions



Note: All dimensions are in millimeters, unless otherwise specified.

Figure 3-2: microSD ArmourDrive Dimensions

3.3 Revision History

Revision	Description	Date
01.000	Initial release as Factsheet	January 21, 2022

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