

## 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 100 MB/s / Up to 37 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 mode: < 400 mA
  - Standby mode: < 1 mA
- **ESD Protection**
  - +4KV/-4KV (contact pads)
- **Reliability**
  - Mean Time Between Failures (MTBF):
    - More than 2 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**
  - 4 bit-per-cell QLC NAND
- **Endurance**
  - Up to 566 TBW
  - 600 P/E cycles
- **Operating Temperature Range**
  - Wide: -25°C to 85°C
- **microSD Card Form Factor**
  - 15 x 11 x 1.0 mm
- **Capacity**
  - Extended Capacity microSD Card (SDXC):
    - 256GB, 512GB, 1TB
- **All Devices are RoHS Compliant**

## Product Description

The GLS93MQ256G4 / 512G4 / 001T4 Wide Temperature microSD ArmourDrive™ QX Series (referred to as microSD ArmourDrive™ in this datasheet) are high-performance, low-power flash memory cards. They combine 256, 512 GBytes or 1 TByte of NAND flash memory with an advanced NAND controller in a standard microSD card form factor.

microSD ArmourDrive is ideal for applications that require hot-swappable, small form factor data storage with high shock-resistance. 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.

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

### 1.1 Optimized microSD ArmourDrive

The heart of 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 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 microSD ArmourDrive. The PMU dramatically reduces the power consumption of 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 microSD ArmourDrive firmware integrity.

#### 1.1.3 Embedded Flash File System

The embedded flash file system is an integral part of microSD ArmourDrive. It is integrated in the controller's firmware that performs the following tasks:

1. Manages and optimizes the data access of flash media
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 Correction Code (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

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 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

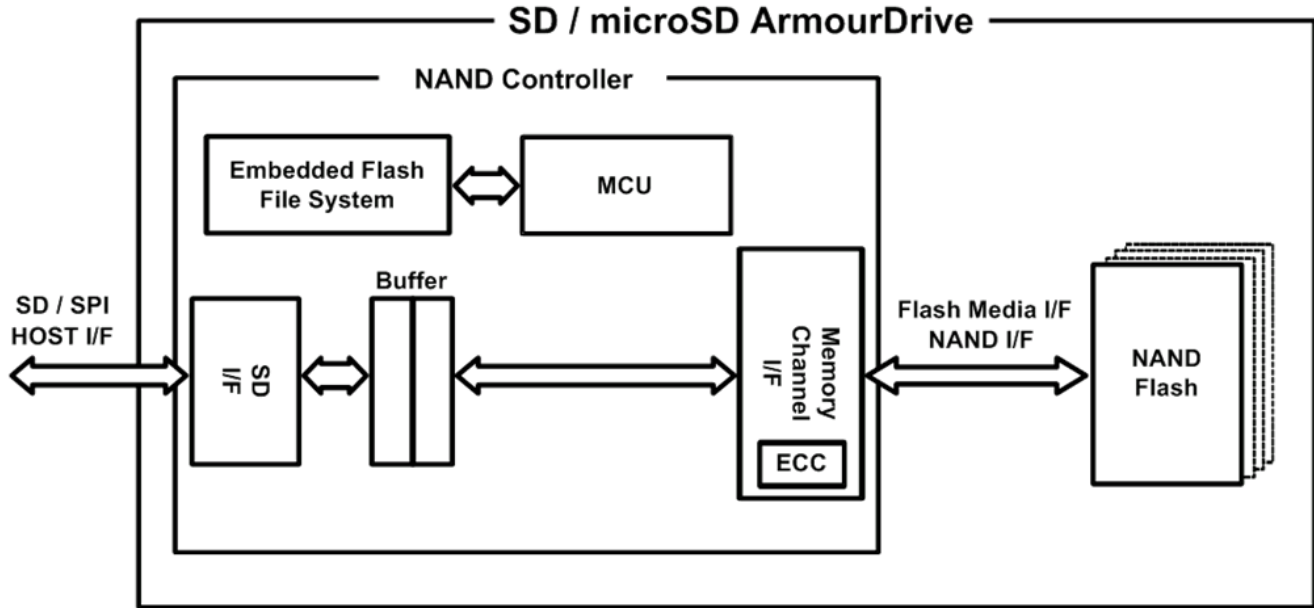
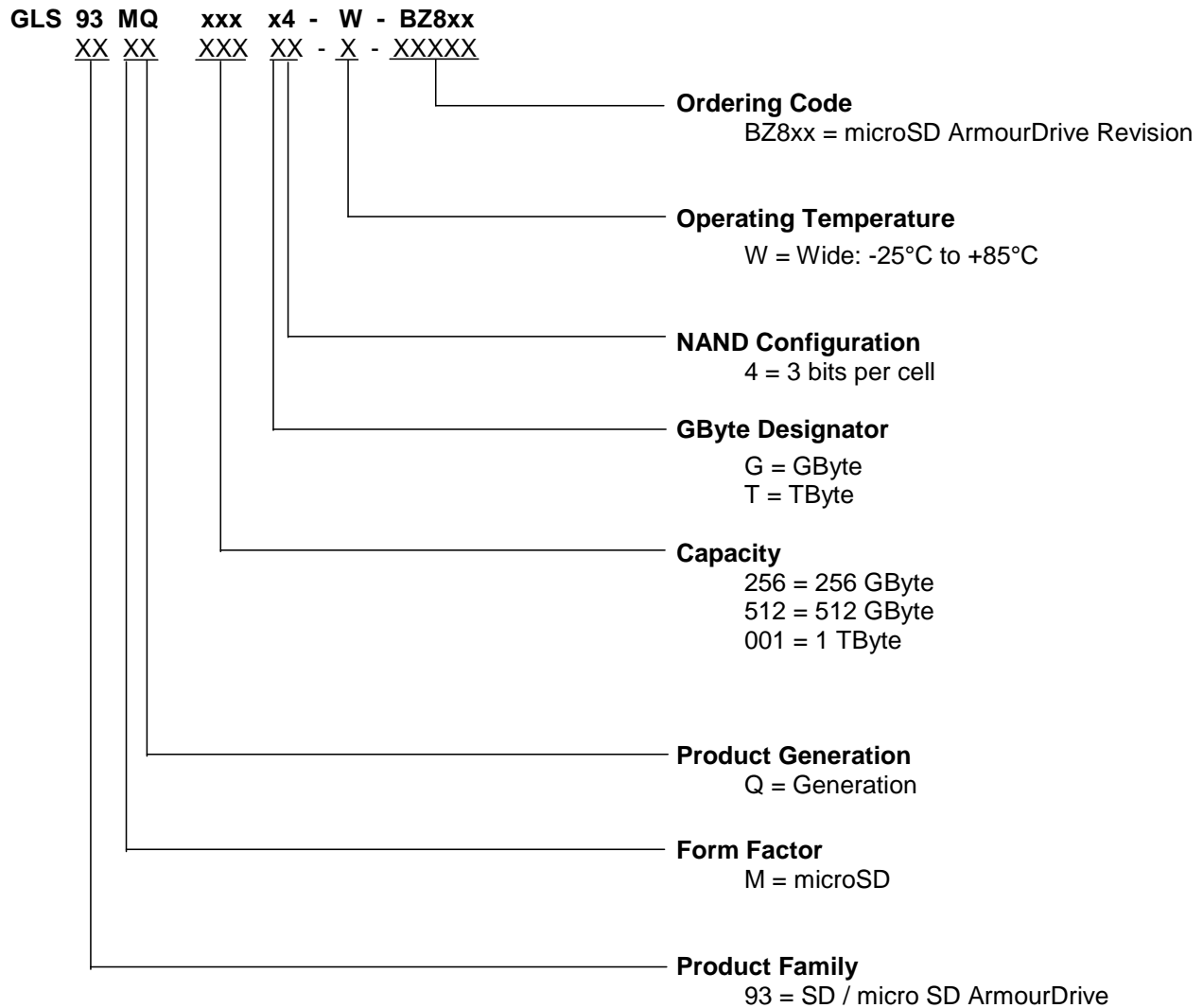


Figure 2-1: microSD ArmourDrive Block Diagram

### 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: microSD ArmourDrive Product Valid Ordering Numbers**

Capacity	Operating Temperature	Part Number	Form Factor
256GB	Wide (-25°C to 85°C)	GLS93MQ256G4-W-BZ804	microSD card
512GB	Wide (-25°C to 85°C)	GLS93MQ512G4-W-BZ804	microSD card
1TB	Wide (-25°C to 85°C)	GLS93MQ001T4-W-BZ804	microSD card

### 3.2 Product Diagrams

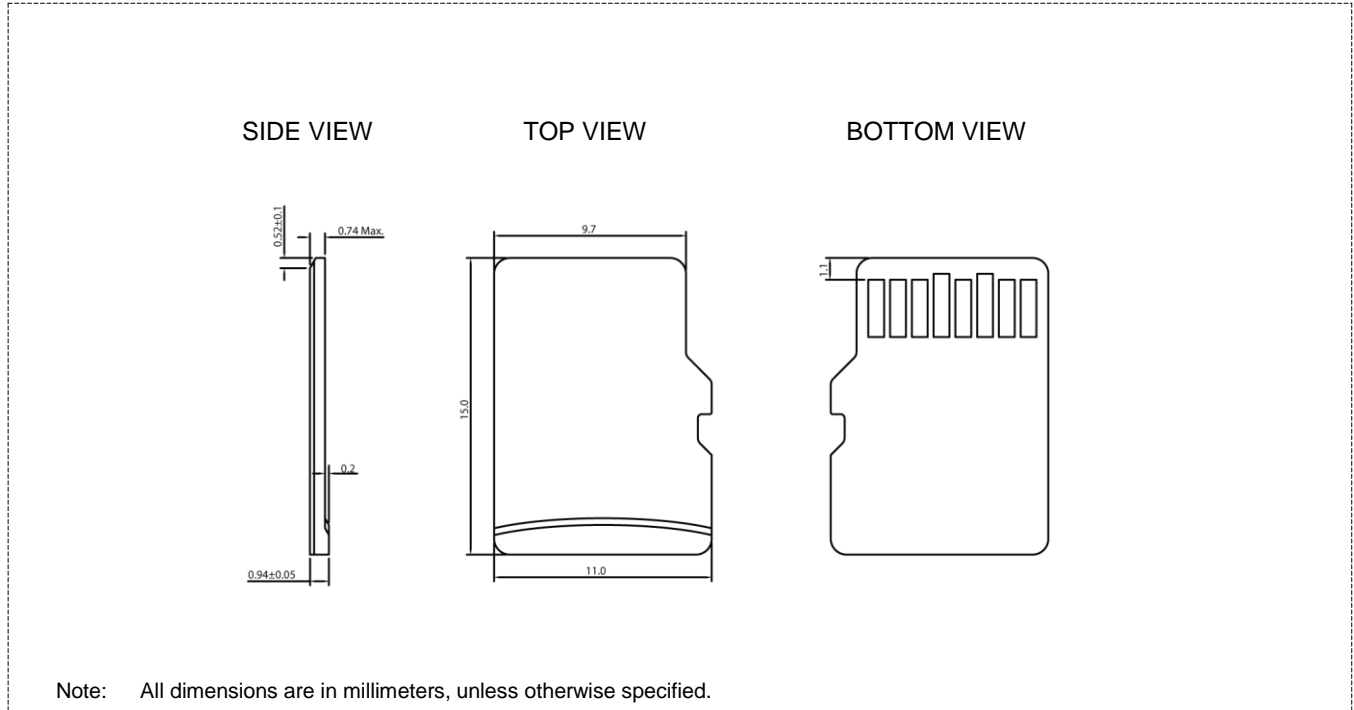


Figure 3-2: microSD ArmourDrive Dimensions

### 3.3 Revision History

Revision	Description	Date
01.000	Initial release as Factsheet	March 19, 2021

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