# GLS89SQ128G3 / 256G3 / 512G3 / 001T3 / 002T3

## Commercial Temp **SATA 2.5" ArmourDrive™** PX Series

**Greenliant**®

## Features

- **Industry Standard SATA Host Interface**
  - SATA 1.5Gb/s, 3Gb/s and 6Gb/s
  - SATA Revision 3.2
  - ATA/ATAPI-8 compliant
  - Supports 48-bit address feature set
  - Native Command Queuing (NCQ) up to 32 commands
- **Performance**
  - Sequential data read: Up to 550 MB/s*
  - Sequential data write: Up to 530 MB/s* (measured using 128KB transfer size)
- **Power Management**
  - 5V power supply
  - Host initiated power management (HIPM)
  - Device initiated power management (DIPM)
- **Power Consumption**
  - Active mode:
    2TB: < 2,300mW
    1TB: < 2,200mW
    512GB: < 2,100mW
    256GB: < 2,100mW
    128GB: < 1,300mW
  - Idle mode: < 87mW
  - Slumber mode: < 32mW
  - DevSleep mode (optional): < 1.9mW

- **Reliability**
  - Mean Time Between Failures (MTBF): 1.6 million hours
- **DRAM for Enhanced Performance**
- **Data Protection**
  - End-to-end data path protection
  - Supports TCG OPAL
  - Crypto Erase (cryptographic key reset)
  - Secure Erase (data sanitization)
- **Supports SMART and TRIM Commands**
- **20-Byte Serial Number**
  - Factory pre-programmed unique ID
- **Built-in ECC**
  - Uses advanced LDPC bit error detection and correction optimized for 3D NAND
- **Industrial 3D TLC NAND Flash**
- **Endurance**
  - Program/Erase (P/E) cycles: 3K
  - TeraBytes Written (TBW): Up to 3,675
- **Operating Temperature Range**
  - Commercial: 0°C to 70°C
- **2.5-inch Form Factor**
  - 100mm x 69.85mm x 7.00mm
- **All Devices are RoHS Compliant**

## Product Description

The GLS89SQ128G3 / 256G3 / 512G3 / 001T3 / 002T3 Commercial Temperature SATA 2.5" ArmourDrive™ PX Series (referred to as 2.5" ArmourDrive" in this factsheet) are high-performance, high-reliability solid state drives. They combine 128, 256 or 512 GBytes, or 1 or 2 TBytes of NAND flash memory with DRAM and an advanced Serial ATA (SATA) controller in a standard 2.5-inch form factor housing.

2.5" ArmourDrive is ideal for applications that require hot-swappable and reliable data storage. 2.5" SATA solid state storage technology is widely used in servers, laptops, network-attached storage, industrial computers, navigation systems, test and measurement instrumentation, multi-function printers, security and surveillance equipment, digital signage and networking systems. These removable solid state drives (SSDs) surpass traditional hard disk drives (HDDs) in their security, reliability, ruggedness and low power consumption.

The SATA SSD controller with built-in advanced NAND management firmware communicates with the host through the standard SATA 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.

2.5" ArmourDrive's advanced NAND management technology improves endurance, enhances data security and helps prevent data corruption during unexpected power failure 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 2.5" ArmourDrive integrates a SATA SSD controller with NAND flash multi-chip packages and DRAM in a standard 2.5-inch form factor housing. Refer to Figure 2-1 for the 2.5" ArmourDrive block diagram.

## 1.1 Optimized 2.5" ArmourDrive

The heart of 2.5" ArmourDrive is the SATA SSD controller, which translates standard SATA signals into flash media data and control signals. The following components contribute to 2.5" ArmourDrive's operation.

### 1.1.1 Microcontroller Unit (MCU)

The MCU translates SATA commands into data and control signals required for flash media operation.

### 1.1.2 Internal Direct Memory Access (DMA)

2.5" ArmourDrive uses internal DMA allowing instant data transfer from/to buffer to/from flash media. This implementation eliminates microcontroller overhead associated with the traditional, firmware-based approach, thereby increasing the data transfer rate.

### 1.1.3 Power Management Unit (PMU)

The PMU controls the power consumption of 2.5" ArmourDrive. The PMU dramatically reduces the power consumption of 2.5" 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 2.5" ArmourDrive firmware integrity. For regular power management, the host must send an IDLE_IMMEDIATE command and wait for command ready before powering down 2.5" ArmourDrive.

### 1.1.4 Embedded Flash File System

The embedded flash file system is an integral part of 2.5" 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

### 1.1.5 Power Interrupt Data Protection

Power Interrupt Data Protection is a mechanism to help prevent data corruption during unexpected power failure events. Enhanced data integrity is supported by the controller's advanced firmware during abnormal power loss. The controller proactively optimizes the amount and stay time of the "in-flight" data residing in the cache. To ensure there is no data loss risk caused by power cycling, the controller sends an acknowledgement to the host only when the incoming data is fully committed to the NAND flash.

### 1.1.6 Error Correction Code (ECC)

The ECC technology uses advanced Low Density Parity Check (LDPC) algorithms to detect and correct errors, ensuring data integrity and extending the SSD lifespan.

### 1.1.7 Multi-tasking Interface

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

## 1.2 Advanced NAND Management

2.5" 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 in all or select 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.

## 1.3 Advanced Data Security

Advanced data security measures include end-to-end data path protection, data sanitization (Secure Erase) and cryptographic erase (Crypto Erase) support. Secure Erase is an effective method to quickly wipe all data from a SATA-based SSD using the SATA protocol. Cryptographic erase resets the cryptographic key of an OPAL-activated SSD making all encrypted user data useless. 2.5" ArmourDrive's controller supports industry standard AES-256 encryption to protect sensitive user data.
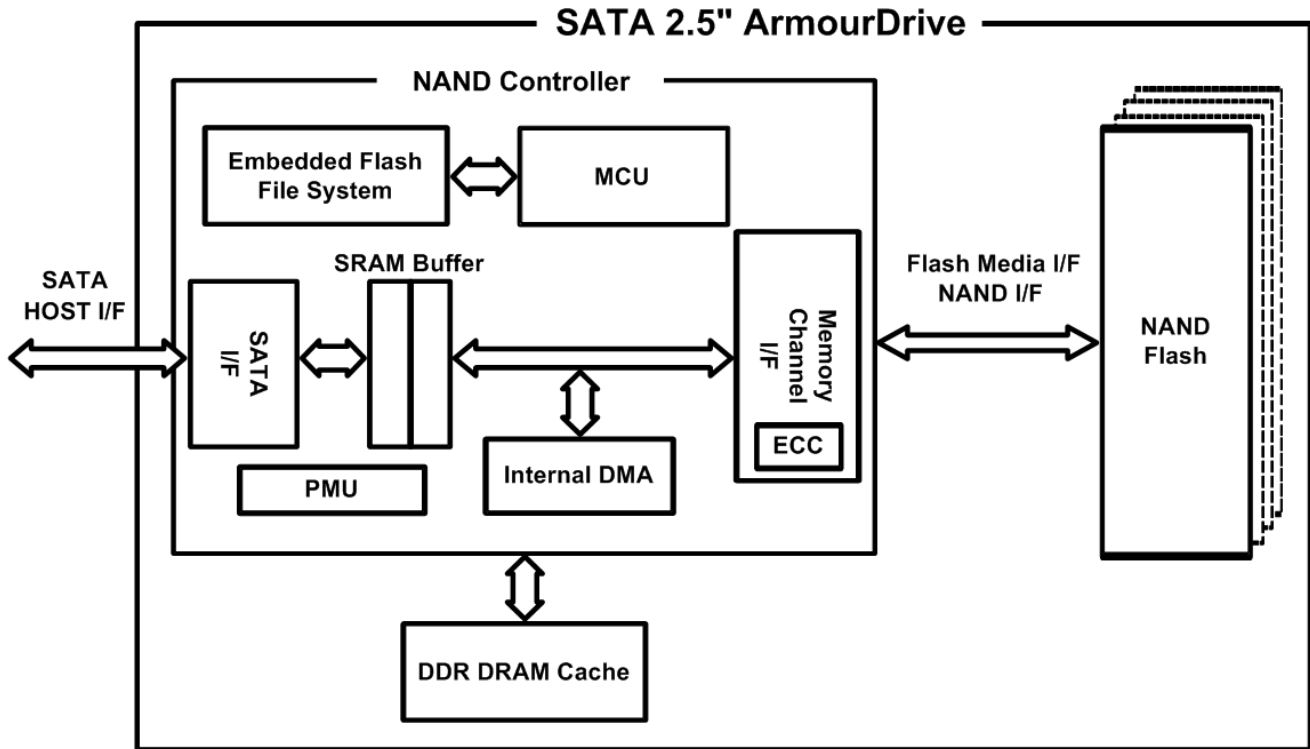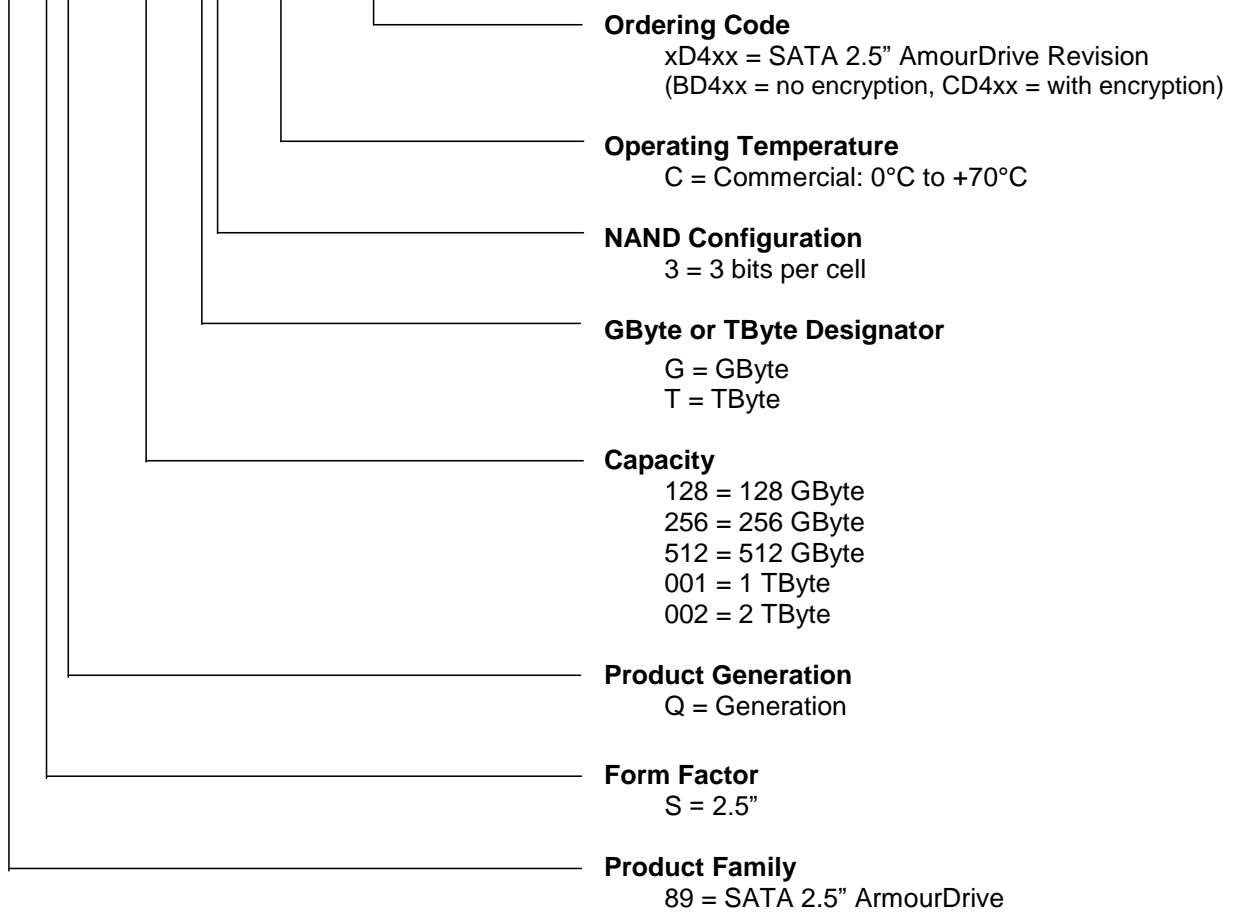
## 2.0    FUNCTIONAL BLOCKS



**Figure 2-1: SATA 2.5" ArmourDrive Block Diagram**

## 3.0 APPENDIX

## 3.1 Product Ordering Information

```
GLS  89  SQ    xxx  x3 - C - xD4xx
     XX  XX    XXX  XX - X - XXXXX
```

**Ordering Code**
xD4xx = SATA 2.5" AmourDrive Revision
(BD4xx = no encryption, CD4xx = with encryption)

**Operating Temperature**
C = Commercial: 0°C to +70°C

**NAND Configuration**
3 = 3 bits per cell

**GByte or TByte Designator**
G = GByte
T = TByte

**Capacity**
128 = 128 GByte
256 = 256 GByte
512 = 512 GByte
001 = 1 TByte
002 = 2 TByte

**Product Generation**
Q = Generation

**Form Factor**
S = 2.5"

**Product Family**
89 = SATA 2.5" ArmourDrive

**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: SATA 2.5" ArmourDrive Product Valid Ordering Numbers**

| Capacity | Operating Temperature | Part Number | Form Factor |
|---|---|---|---|
| 128GB | Commercial (0°C to 70°C) | GLS89SQ128G3-C-BD400 | 2.5-inch |
| | | GLS89SQ128G3-C-BD402 | |
| | | GLS89SQ128G3-C-CD400 | |
| | | GLS89SQ128G3-C-CD402 | |
| 256GB | Commercial (0°C to 70°C) | GLS89SQ256G3-C-BD400 | 2.5-inch |
| | | GLS89SQ256G3-C-BD402 | |
| | | GLS89SQ256G3-C-CD400 | |
| | | GLS89SQ256G3-C-CD402 | |
| 512GB | Commercial (0°C to 70°C) | GLS89SQ512G3-C-BD400 | 2.5-inch |
| | | GLS89SQ512G3-C-BD402 | |
| | | GLS89SQ512G3-C-CD400 | |
| | | GLS89SQ512G3-C-CD402 | |
| 1TB | Commercial (0°C to 70°C) | GLS89SQ001T3-C-BD400 | 2.5-inch |
| | | GLS89SQ001T3-C-BD402 | |
| | | GLS89SQ001T3-C-CD400 | |
| | | GLS89SQ001T3-C-CD402 | |
| 2TB | Commercial (0°C to 70°C) | GLS89SQ002T3-C-BD400 | 2.5-inch |
| | | GLS89SQ002T3-C-BD402 | |
| | | GLS89SQ002T3-C-CD400 | |
| | | GLS89SQ002T3-C-CD402 | |

## 3.2 Mechanical Diagrams



TOP VIEW

69.85±0.25

100.10±0.25

SIDE VIEW

7.00 +0.10 / -0.50

14.00±0.25

90.60±0.25

FRONT VIEW

3.40±0.38

BOTTOM VIEW

9.40±0.50

72.60
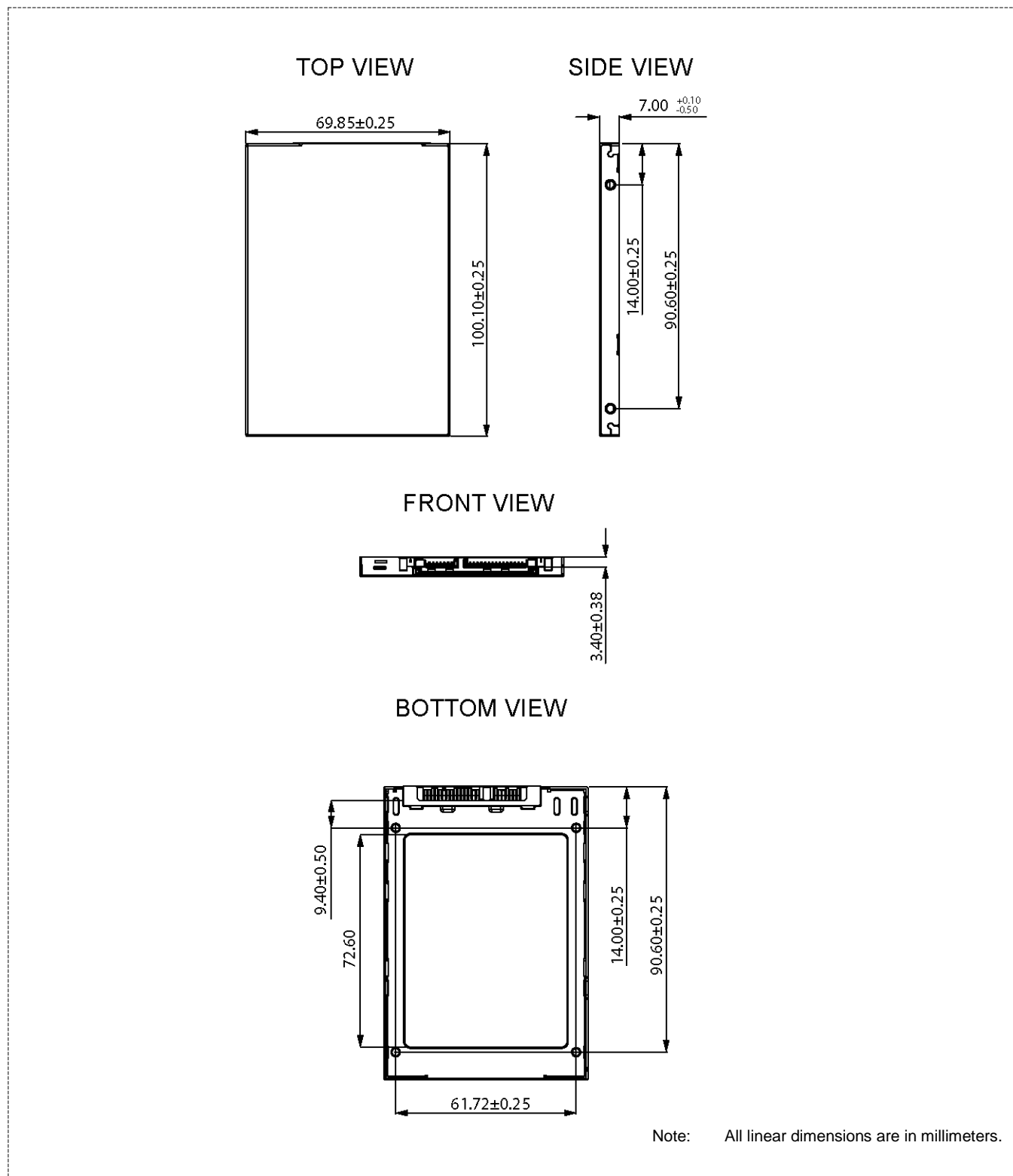
14.00±0.25

90.60±0.25

61.72±0.25

Note:     All linear dimensions are in millimeters.

**Figure 3-1: SATA 2.5" ArmourDrive Dimensions**