GLS86FQxxG1 / GLS86FQxxG8
Industrial Grade **mSATA ArmourDrive™** EX Series

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 370 MB/s
  - Sequential data write: Up to 315 MB/s (measured using 128 KB transfer size)
- **Power Management**
  - 3.3V power supply
  - Host initialized power management (HIPM)
  - Device initialized power management (DIPM)
- **Power Consumption**
  - Active mode:
    320GB: Up to 1700mW
    160GB: Up to 1630mW
    80GB: Up to 1520mW
    40GB: Up to 1440mW
    20GB: Up to 1150mW
  - Idle mode: < 450mW
  - DevSleep mode: < 45mW
- **Thermal Throttling**
- **Supports TRIM and SMART Commands**
- **Robust Built-in ECC**

- **Reliability**
  - Mean Time Between Failures (MTBF): More than 2 million hours
- **Expanded Data Protection**
  - Added data security through user-selectable protection zones
  - Secure erase / Data sanitization
- **20-Byte Serial Number**
  - Factory pre-programmed unique ID
  - User-programmable 10-Byte ID
- **NAND Configuration**
  - 1 bit per cell (SLC)
  - Designed with Greenliant's advanced EnduroSLC™ Technology
- **High Endurance**
  - GLS86FQxxxG1:
    Program/Erase (P/E) cycles: 60K
    TeraBytes Written (TBW): Up to 14,116
  - GLS86FQxxxG8:
    P/E cycles: 120K
    TBW: Up to 28,232
- **Operating Temperature Range**
  - Industrial: -40°C to 85°C
- **JEDEC standard MO-300 mSATA form factor**
  - 29.85 mm x 50.80 mm x 4.85 mm
- **All Devices are RoHS Compliant**

Product Description

The GLS86FQ020G1 / 040G1 / 080G1 / 160G1 / 320G1 / 020G8 / 040G8 / 080G8 / 160G8/ 320G8 Industrial Grade mSATA ArmourDrive™ EX Series modules (referred to as "mSATA ArmourDrive" in this factsheet) are high-endurance, high-reliability solid state drives. They include 20, 40, 80, 160 or 320 GBytes of NAND flash memory with an advanced Serial ATA (SATA) controller on a printed circuit board (PCB).

mSATA ArmourDrive is ideal for applications that require removable form factor and more reliable data storage. mSATA solid state storage technology is widely used in industrial computers, test and measurement instrumentation, multi-functional printers, medical equipment, security and surveillance systems, network servers and digital signage. These removable solid state drives (SSDs) surpass traditional hard disk drives (HDDs) in their small size, security, reliability, ruggedness and low power consumption.

The NAND flash 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.

mSATA ArmourDrive is pre-programmed with a 10-Byte unique serial ID and has the option of programming an additional 10-Byte serial ID for even greater system security.

mSATA ArmourDrive's advanced NAND management technology improves endurance, enhances data security and prevents data corruption during unexpected power loss events. This innovative technology combines robust NAND flash 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 mSATA ArmourDrive module integrates a SATA SSD controller with NAND flash multi-chip packages. Refer to Figure 2-1 for the mSATA ArmourDrive block diagram.

1.1   Optimized mSATA ArmourDrive

The heart of mSATA ArmourDrive is the SATA NAND flash controller, which translates standard SATA signals into flash media data and control signals. The following components contribute to mSATA 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)

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

1.1.4   Embedded Flash File System

The embedded flash file system is an integral part of mSATA 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   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 fast, sequential write performance by allowing concurrent Read, Program and Erase operations to multiple flash media.

1.2   EnduroSLC™ Technology

EnduroSLC™ is a proprietary 3D NAND management technology developed by Greenliant for high reliability applications requiring ultra-high endurance and superior data retention. Using 1-bit-per-cell (SLC) NAND configuration, EnduroSLC enabled SSDs are ideal for write-intensive applications used in extreme temperature, high stress environments. EnduroSLC enabled solid state drives offer a high reliability flash storage solution with ultra-high write endurance that exceeds capabilities of legacy, planar SLC NAND based products.

1.3   Advanced NAND Management

mSATA ArmourDrive's SATA 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.
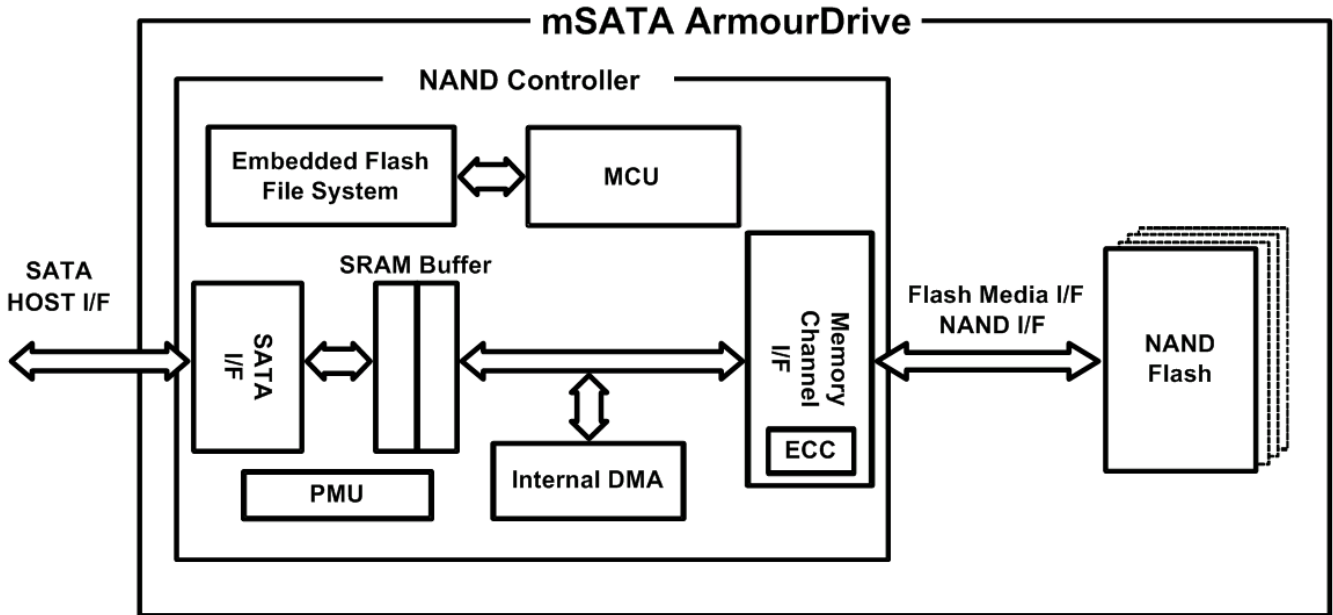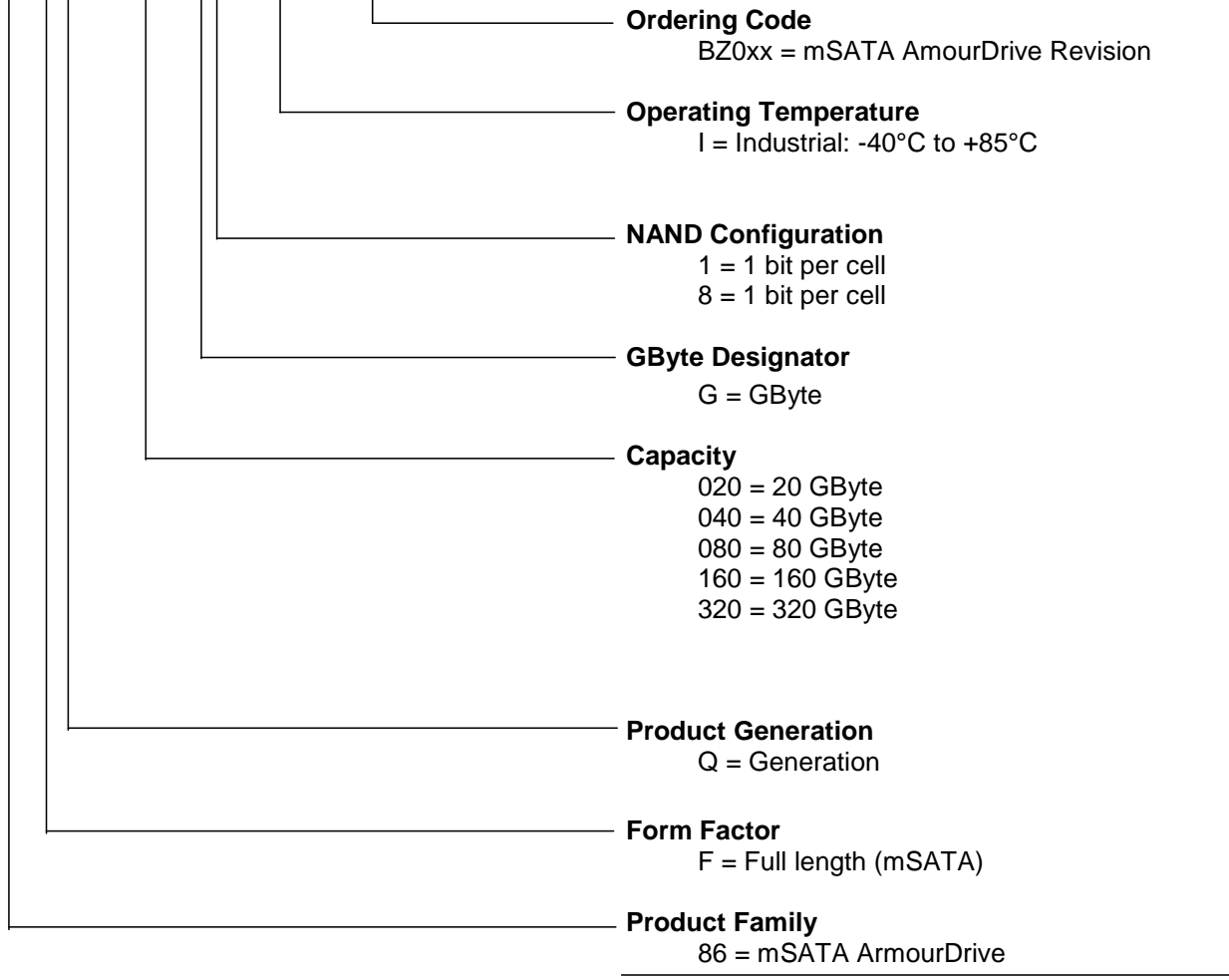
2.0   FUNCTIONAL BLOCKS

Figure 2-1: mSATA ArmourDrive Block Diagram

3.0   APPENDIX

3.1   Product Ordering Information

```
GLS  86  FQ    xxx   Gx  -  I  -  BZ0xx
XX  XX    XXX   XX  -  X  -  XXXXX
```

Ordering Code
BZ0xx = mSATA AmourDrive Revision

Operating Temperature
I = Industrial: -40°C to +85°C

NAND Configuration
1 = 1 bit per cell
8 = 1 bit per cell

GByte Designator
G = GByte

Capacity
020 = 20 GByte
040 = 40 GByte
080 = 80 GByte
160 = 160 GByte
320 = 320 GByte

Product Generation
Q = Generation

Form Factor
F = Full length (mSATA)

Product Family
86 = mSATA 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: mSATA ArmourDrive Product Valid Ordering Numbers

Capacity	Operating Temperature	Part Number	Form Factor
20GB	Industrial (-40°C to 85°C)	GLS86FQ020G1-I-BZ004	JEDEC MO-300 (full length)
		GLS86FQ020G8-I-BZ005	
40GB	Industrial (-40°C to 85°C)	GLS86FQ040G1-I-BZ004	JEDEC MO-300 (full length)
		GLS86FQ040G8-I-BZ005	
80GB	Industrial (-40°C to 85°C)	GLS86FQ080G1-I-BZ004	JEDEC MO-300 (full length)
		GLS86FQ080G8-I-BZ005	
160GB	Industrial (-40°C to 85°C)	GLS86FQ160G1-I-BZ004	JEDEC MO-300 (full length)
		GLS86FQ160G8-I-BZ005	
320GB	Industrial (-40°C to 85°C)	GLS86FQ320G1-I-BZ004	JEDEC MO-300 (full length)
		GLS86FQ320G8-I-BZ005	

3.2 Board Diagrams
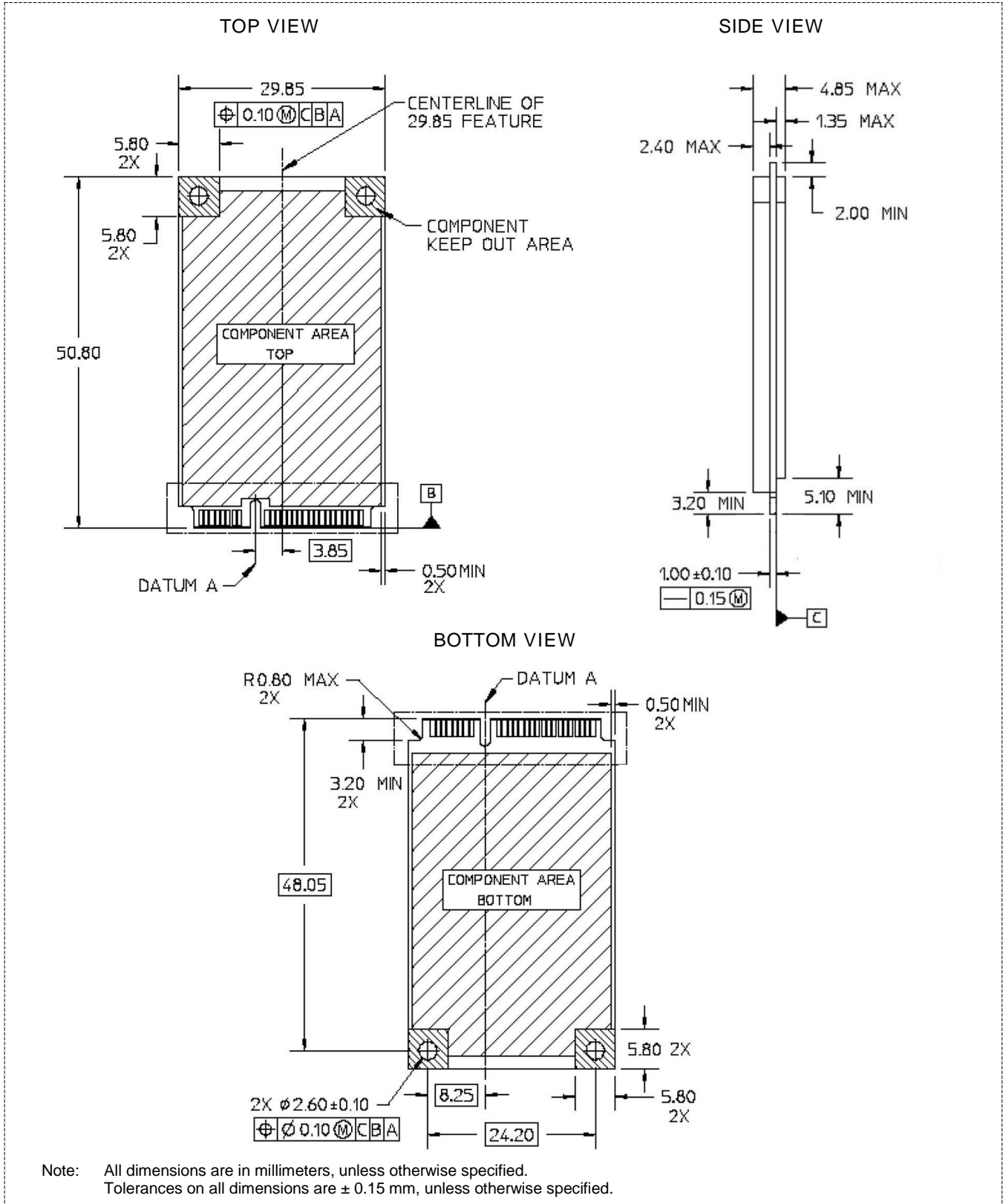
Figure 3-1: mSATA ArmourDrive Dimensions

Revision History

Revision	Description	Date
01.000	Initial Release as Factsheet	November 25, 2022

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