GLS86FQ064G3 / 128G3 / 256G3 / 512G3
Industrial Temp **mSATA 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 440 MByte/sec
  - Sequential data write: Up to 83 MByte/sec (measured using 128 KByte transfer size)
- **Power Management**
  - 3.3V power supply
- **Power Consumption**
  - Active mode:
    512GB: Up to 1400mW
    256GB: Up to 1400mW
    128GB: Up to 1400mW
    64GB: Up to 1100mW
  - Idle mode: < 400mW (typical)
  - DevSleep mode: < 45mW (typical)
- **Thermal Throttling**

- **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
- **Supports TRIM and SMART Commands**
- **Robust Built-in ECC**
- **Industrial 3D TLC NAND Flash**
- **Endurance**
  - Program/Erase (P/E) cycles: 5K
  - TeraBytes Written (TBW): up to 1,700
- **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 GLS86FQ064G3 / 128G3 / 256G3 / 512G3 Industrial Temperature mSATA ArmourDrive™ PX Series modules (referred to as "mSATA ArmourDrive" in this datasheet) are high-reliability solid state drives. They include 64, 128, 256 or 512 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.

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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 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.
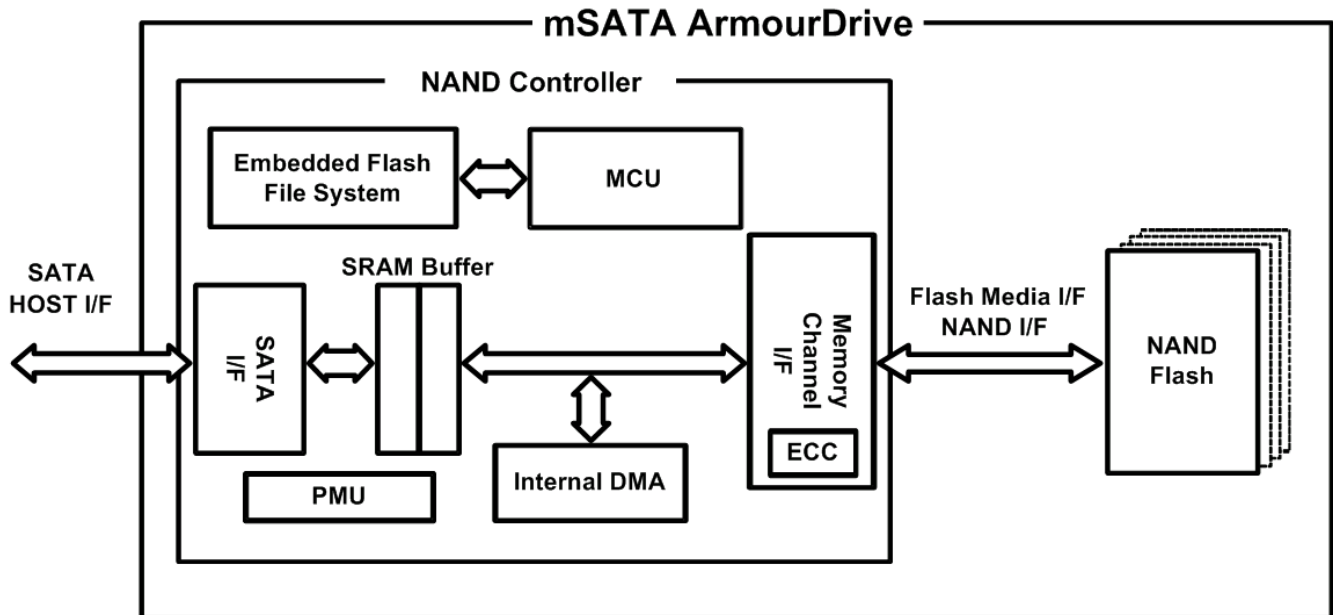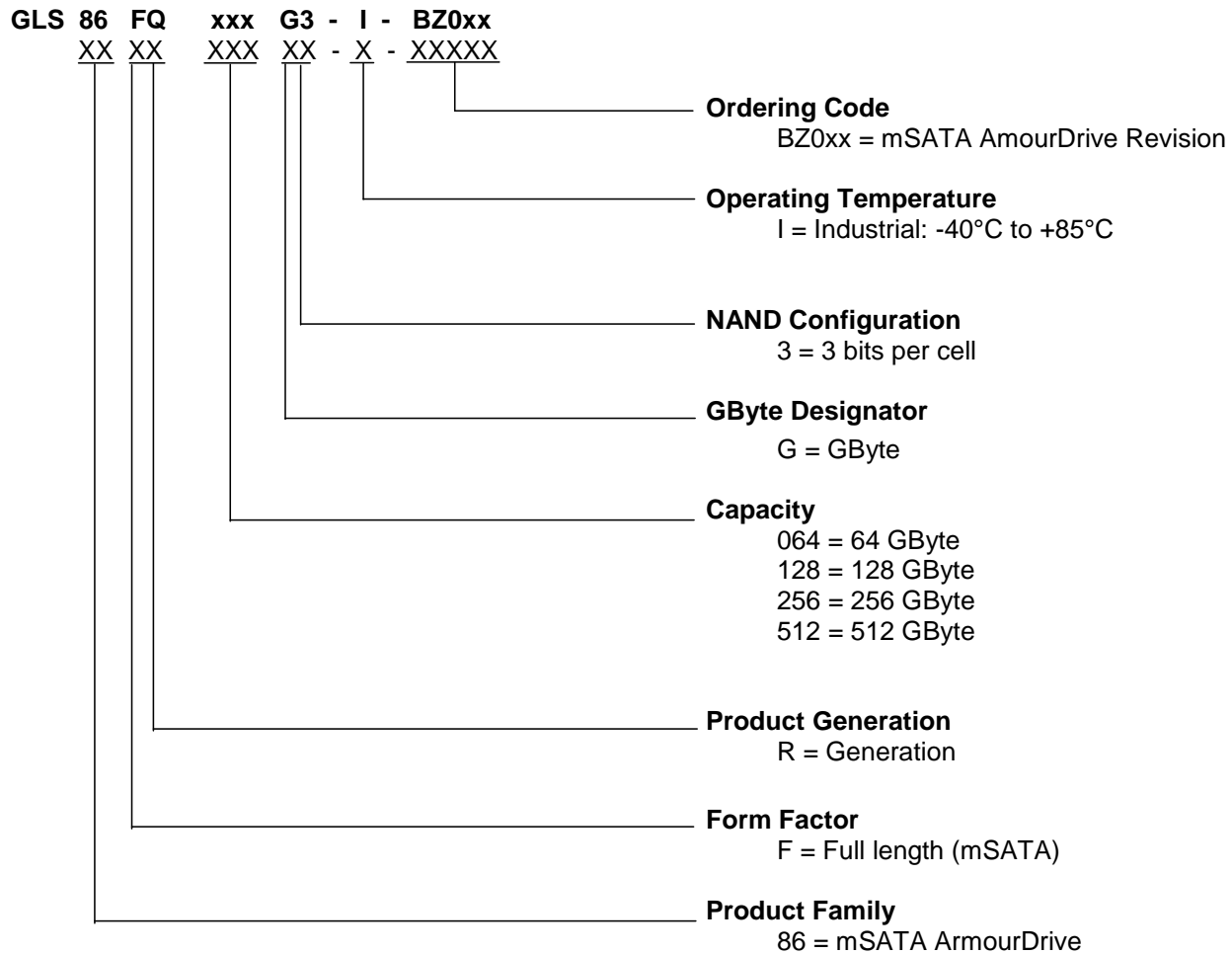
2.0   FUNCTIONAL BLOCKS

Figure 2-1: mSATA ArmourDrive Block Diagram

3.0   APPENDIX

3.1   Product Ordering Information

```
GLS  86  FQ   xxx  G3 - 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
3 = 3 bits per cell

GByte Designator
G = GByte

Capacity
064 = 64 GByte
128 = 128 GByte
256 = 256 GByte
512 = 512 GByte

Product Generation
R = 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

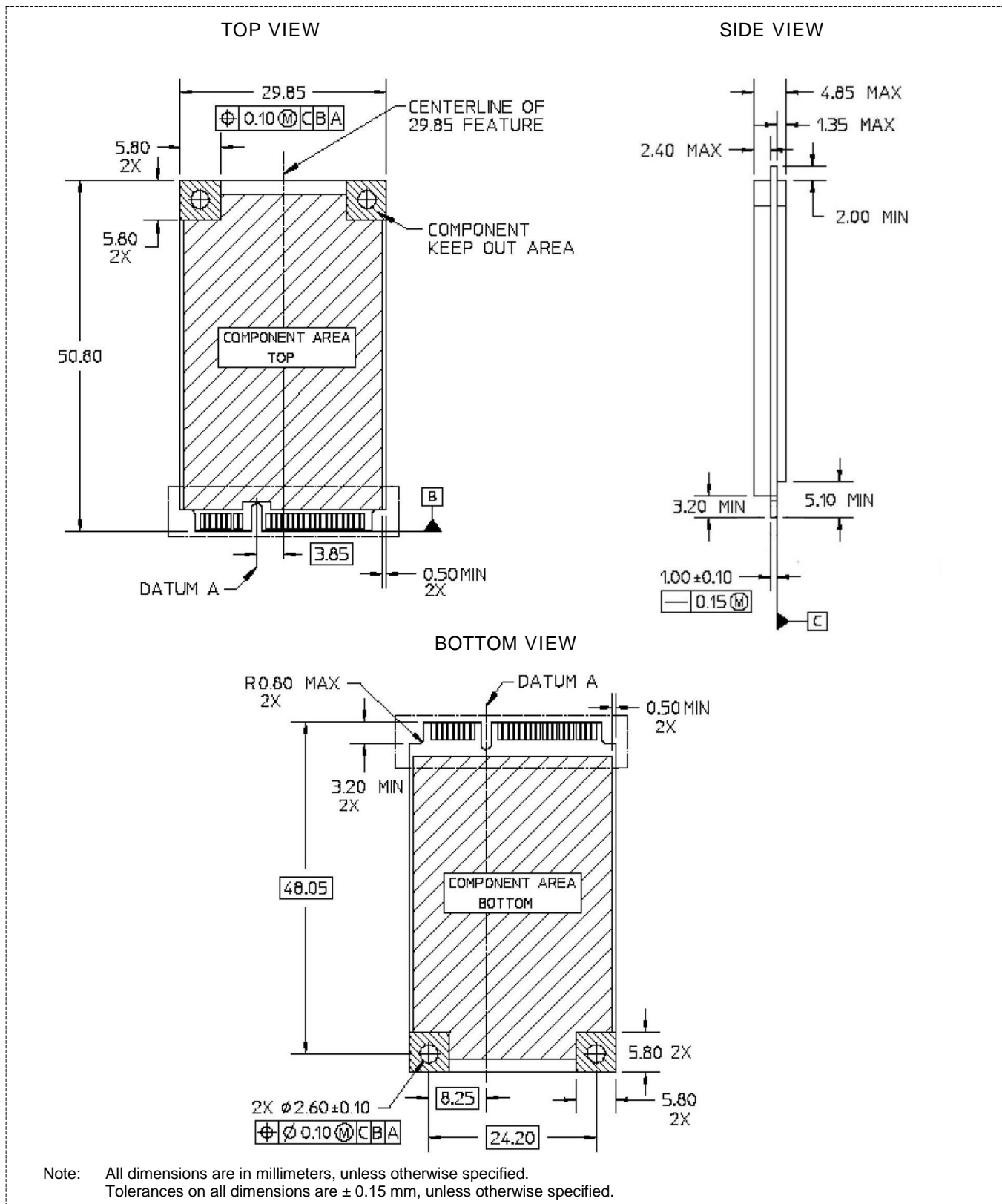| Capacity	Operating Temperature	Part Number	Form Factor
64GB	Industrial (-40°C to 85°C)	GLS86FQ064G3-I-BZ003	JEDEC MO-300 (full length)
128GB	Industrial (-40°C to 85°C)	GLS86FQ128G3-I-BZ003	JEDEC MO-300 (full length)
256GB	Industrial (-40°C to 85°C)	GLS86FQ256G3-I-BZ003	JEDEC MO-300 (full length)
512GB	Industrial (-40°C to 85°C)	GLS86FQ512G3-I-BZ003	JEDEC MO-300 (full length)

3.2   Board Diagrams

Figure 3-1: mSATA ArmourDrive Dimensions

Note: All dimensions are in millimeters, unless otherwise specified.
Tolerances on all dimensions are ± 0.15 mm, unless otherwise specified.

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Revision History

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

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