Factsheet 03.000
April 2020

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 500 MB/s (measured using 128KB transfer size)
- **Power Management**
  - 3.3V power supply
  - Host initialized power management (HIPM)
  - Device initialized power management (DIPM)
- **Power Consumption**
  - Active mode:
    1TB: 1650mW (typical)
    512GB: 1550mW (typical)
    256GB: 1450mW (typical)
    128GB: 1350mW (typical)
    64GB: 1215mW (typical)
    32GB: 1100mW (typical)
  - Idle mode: < 335 mW (typical)
  - Slumber mode: < 15 mW (typical)
  - DevSleep mode (optional): < 5 mW (typical)

- **Reliability**
  - Mean Time Between Failures (MTBF): 2 million hours
- **Data Protection**
  - Secure erase / Data sanitization
- **Integrated Current Detector**
  - Protects from inrush current and generates reset during power-up and power-down to prevent inadvertent writes
- **Supports TRIM and SMART 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
- **NAND Configuration**
  - 3 bits per cell (3D TLC)
- **Endurance**
  - 3K P/E cycles (typical)
- **Operating Temperature Range**
  - Industrial: -40°C to 85°C
  - Commercial: 0°C to 70°C (SSD case temperature reported by SMART)
- **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 GLS86FP032G3 / 064G3 / 128G3 / 256G3 / 512G3 / 001T3 Industrial and Commercial Temperature miniSATA (mSATA) ArmourDrive™ PX Series modules (referred to as "mSATA ArmourDrive" in this datasheet) are high-performance, high-reliability solid state drives. They combine 32, 64, 128, 256 or 512 GBytes, or 1 TByte 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, set-top boxes, 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 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.

mSATA ArmourDrive's advanced NAND management technology improves endurance, enhances data security and helps prevent data loss 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.

mSATA ArmourDrive is available in a standard JEDEC 52-pin PCB module form factor.

1.0 GENERAL DESCRIPTION

Each mSATA ArmourDrive module integrates a SATA SSD controller with up to four 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 SSD 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 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

1.1.5 Power Interrupt Data Protection

Power Interrupt Data Protection is a mechanism to prevent data loss 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

mSATA 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.
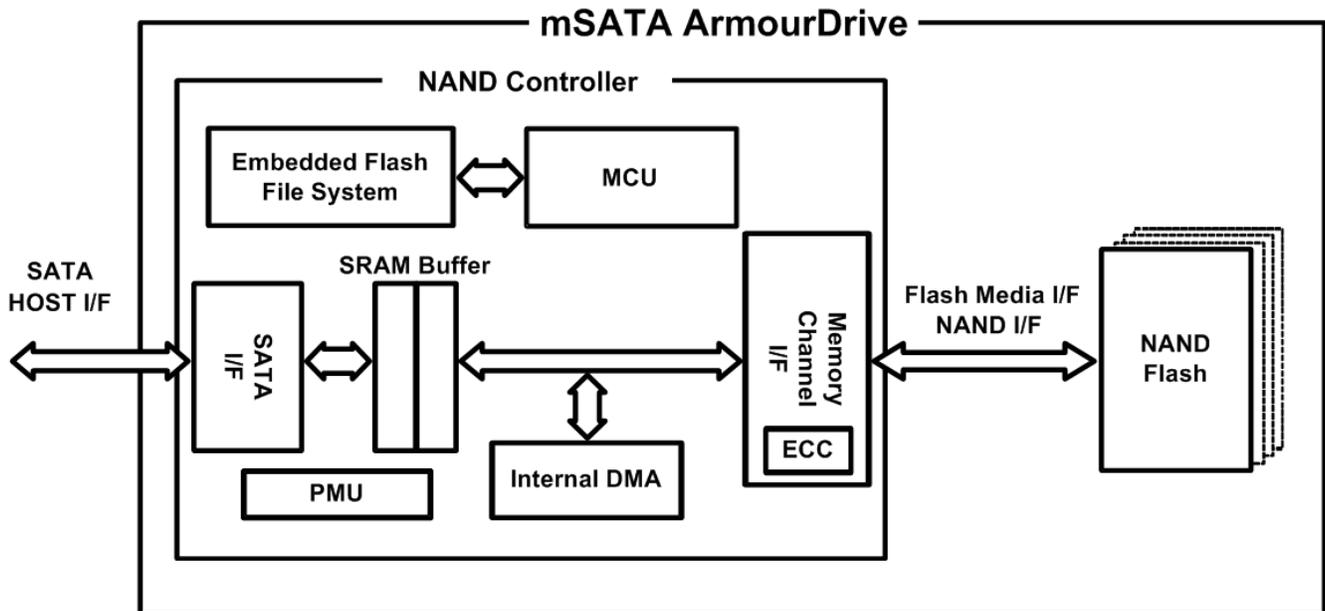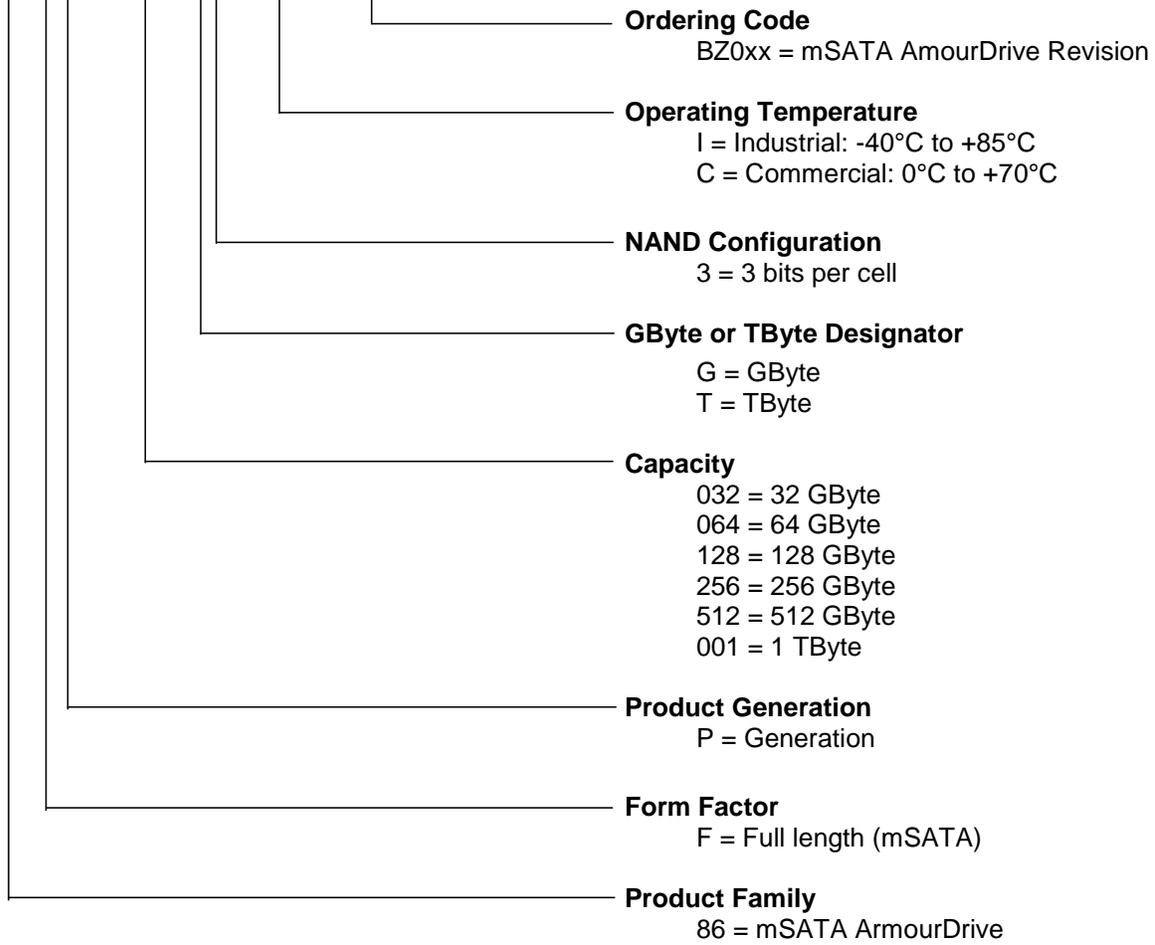
2.0 FUNCTIONAL BLOCKS

Figure 2-1: mSATA ArmourDrive Block Diagram

3.0 APPENDIX

3.1 Product Ordering Information

```
GLS  86  FP   xxx  x3 -  I  -  BZ0xx
     XX  XX   XXX  XX - X  -  XXXXX
```

Ordering Code
BZ0xx = mSATA AmourDrive Revision

Operating Temperature
I = Industrial: -40°C to +85°C
C = Commercial: 0°C to +70°C

NAND Configuration
3 = 3 bits per cell

GByte or TByte Designator
G = GByte
T = TByte

Capacity
032 = 32 GByte
064 = 64 GByte
128 = 128 GByte
256 = 256 GByte
512 = 512 GByte
001 = 1 TByte

Product Generation
P = 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:

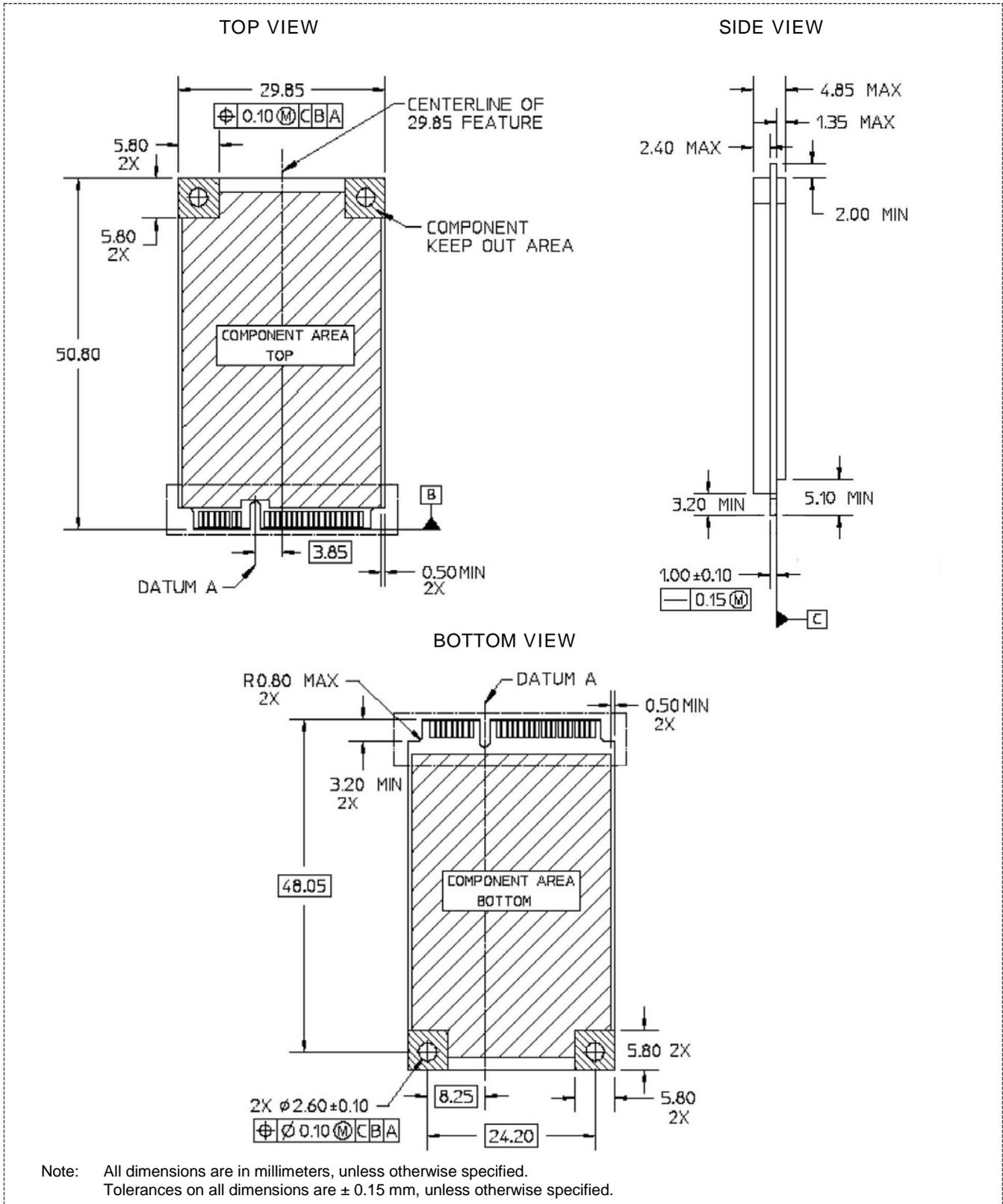| Capacity	Operating Temperature	Part Number	Form Factor
32GB	Industrial (-40°C to 85°C)	GLS86FP032G3-I-BZ000	JEDEC MO-300 (full length)
32GB	Industrial (-40°C to 85°C)	GLS86FP032G3-I-BZ001	JEDEC MO-300 (full length)
32GB	Commercial (0°C to +70°C)	GLS86FP032G3-C-BZ000	JEDEC MO-300 (full length)
64GB	Industrial (-40°C to 85°C)	GLS86FP064G3-I-BZ000	JEDEC MO-300 (full length)
64GB	Industrial (-40°C to 85°C)	GLS86FP064G3-I-BZ001	JEDEC MO-300 (full length)
64GB	Commercial (0°C to +70°C)	GLS86FP064G3-C-BZ000	JEDEC MO-300 (full length)
128GB	Industrial (-40°C to 85°C)	GLS86FP128G3-I-BZ000	JEDEC MO-300 (full length)
128GB	Industrial (-40°C to 85°C)	GLS86FP128G3-I-BZ001	JEDEC MO-300 (full length)
128GB	Commercial (0°C to +70°C)	GLS86FP128G3-C-BZ000	JEDEC MO-300 (full length)
256GB	Industrial (-40°C to 85°C)	GLS86FP256G3-I-BZ000	JEDEC MO-300 (full length)
256GB	Industrial (-40°C to 85°C)	GLS86FP256G3-I-BZ001	JEDEC MO-300 (full length)
256GB	Commercial (0°C to +70°C)	GLS86FP256G3-C-BZ000	JEDEC MO-300 (full length)
512GB	Industrial (-40°C to 85°C)	GLS86FP512G3-I-BZ000	JEDEC MO-300 (full length)
512GB	Industrial (-40°C to 85°C)	GLS86FP512G3-I-BZ001	JEDEC MO-300 (full length)
512GB	Commercial (0°C to +70°C)	GLS86FP512G3-C-BZ000	JEDEC MO-300 (full length)
1TB	Industrial (-40°C to 85°C)	GLS86FP001T3-I-BZ000	JEDEC MO-300 (full length)
1TB	Industrial (-40°C to 85°C)	GLS86FP001T3-I-BZ001	JEDEC MO-300 (full length)
1TB	Commercial (0°C to +70°C)	GLS86FP001T3-C-BZ000	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.

Revision History

Revision	Description	Date
01.000	Initial Release as Factsheet	March 12, 2019
02.000	Added Commercial Temperature part numbers; Updated Features descriptions on page 1	June 26, 2019
03.000	Updated Features descriptions on page 1; Added BZ001 part numbers	April 29, 2020

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