Factsheet 01.000
December 2019

Features

- **Industry Standard ATA 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 520 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:
    1.92TB: < 2,100mW
    960GB: < 2,000mW
    480GB: < 1,800mW
    240GB: < 1,500mW
  - Idle mode: < 900mW
- **DRAM for Enhanced Performance**
- **Supports TRIM and SMART Commands**
- **Reliability**
  - Mean Time Between Failures (MTBF): 2 million hours
- **Data Protection**
  - End-to-end data path protection
  - Supports TCG OPAL
  - Crypto Erase (cryptographic key reset)
  - Secure Erase (data sanitization)
- **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 NAND)
- **Endurance**
  - Program/Erase (P/E) cycles: 3K
- **Operating Temperature Range**
  - Industrial: -40°C to 85°C (as reported by SMART)
- **M.2 2280 Form Factors**
  - 22mm x 80mm x 3.50mm
  - Double-sided (DS), B+M key
- **All Devices are RoHS Compliant**

Product Description

The GLS87BQ240G3 / 480G3 / 960G3 / 1T923 Industrial Temperature SATA M.2 ArmourDrive™ PX Series modules (referred to as “M.2 ArmourDrive” in this factsheet) are high-performance, high-reliability solid state drives. They combine 240, 480 or 960 GBytes, or 1.92 TByte of NAND flash memory with DRAM and an advanced Serial ATA (SATA) controller on a printed circuit board (PCB).

M.2 ArmourDrive is ideal for applications that require removable form factor and more reliable data storage. SATA M.2 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 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.

M.2 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.

M.2 ArmourDrive is available in a standard 2280 (22mm x 80mm) module form factor.

© 2019 Greenliant

1.0 GENERAL DESCRIPTION

Each M.2 ArmourDrive module integrates a SATA SSD controller with NAND flash multi-chip packages and DRAM. Refer to Figure 2-1 for the M.2 ArmourDrive block diagram.

1.1 Optimized M.2 ArmourDrive

The heart of M.2 ArmourDrive is the SATA SSD controller, which translates standard SATA signals into flash media data and control signals. The following components contribute to M.2 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)

M.2 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 M.2 ArmourDrive. The PMU dramatically reduces the power consumption of M.2 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 M.2 ArmourDrive firmware integrity. For regular power management, the host must send an IDLE_IMMEDIATE command and wait for command ready before powering down M.2 ArmourDrive.

1.1.4 Embedded Flash File System

The embedded flash file system is an integral part of M.2 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 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

M.2 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. M.2 ArmourDrive's controller supports industry standard AES-256 encryption to protect sensitive user data.

© 2019 Greenliant

2.0 FUNCTIONAL BLOCKS

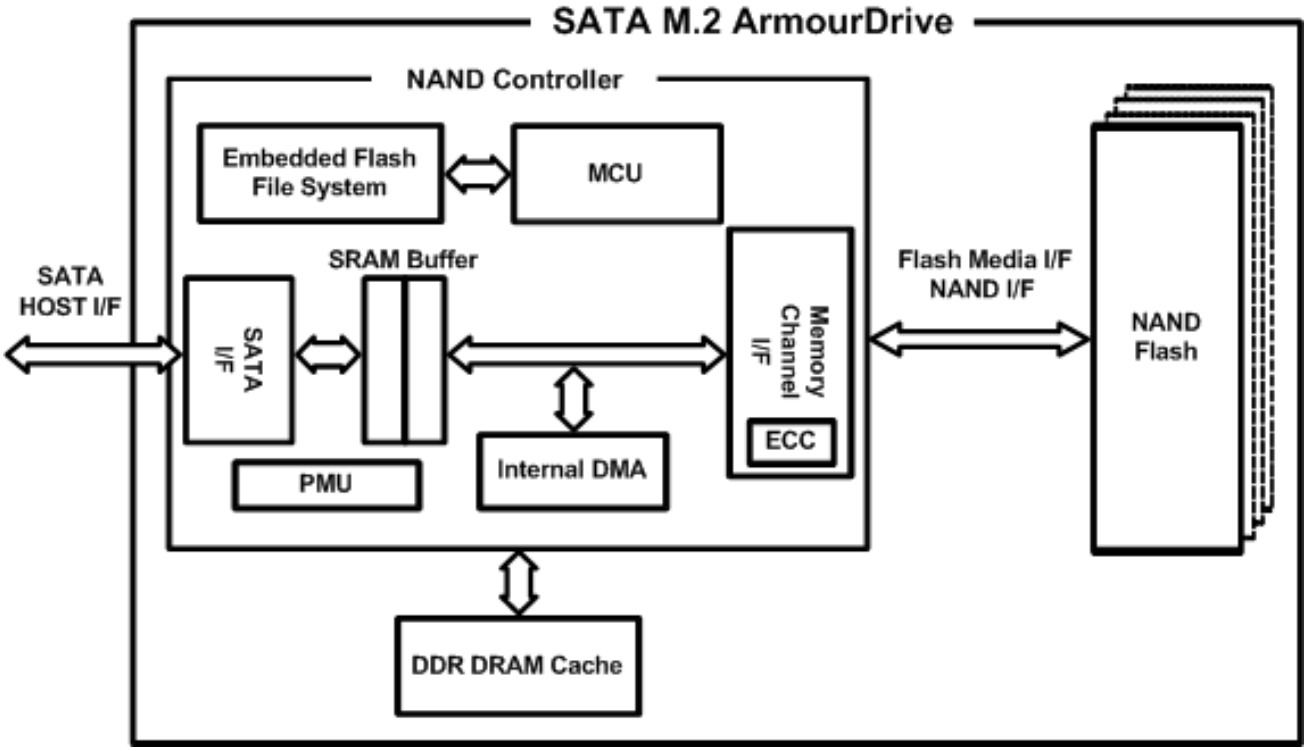
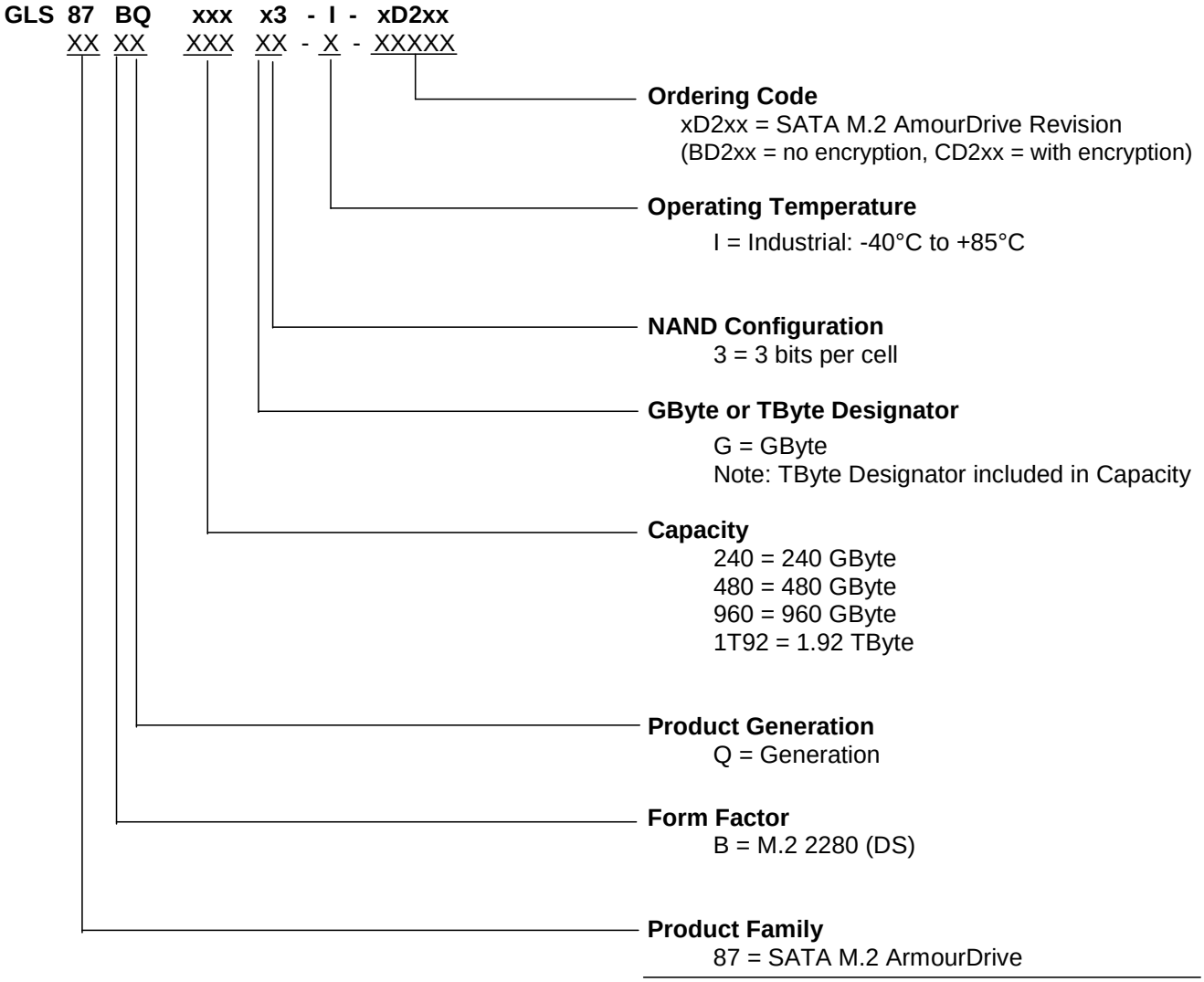


Figure 2-1: M.2 ArmourDrive Block Diagram

3.0 APPENDIX

3.1 Product Ordering Information



Valid Combinations

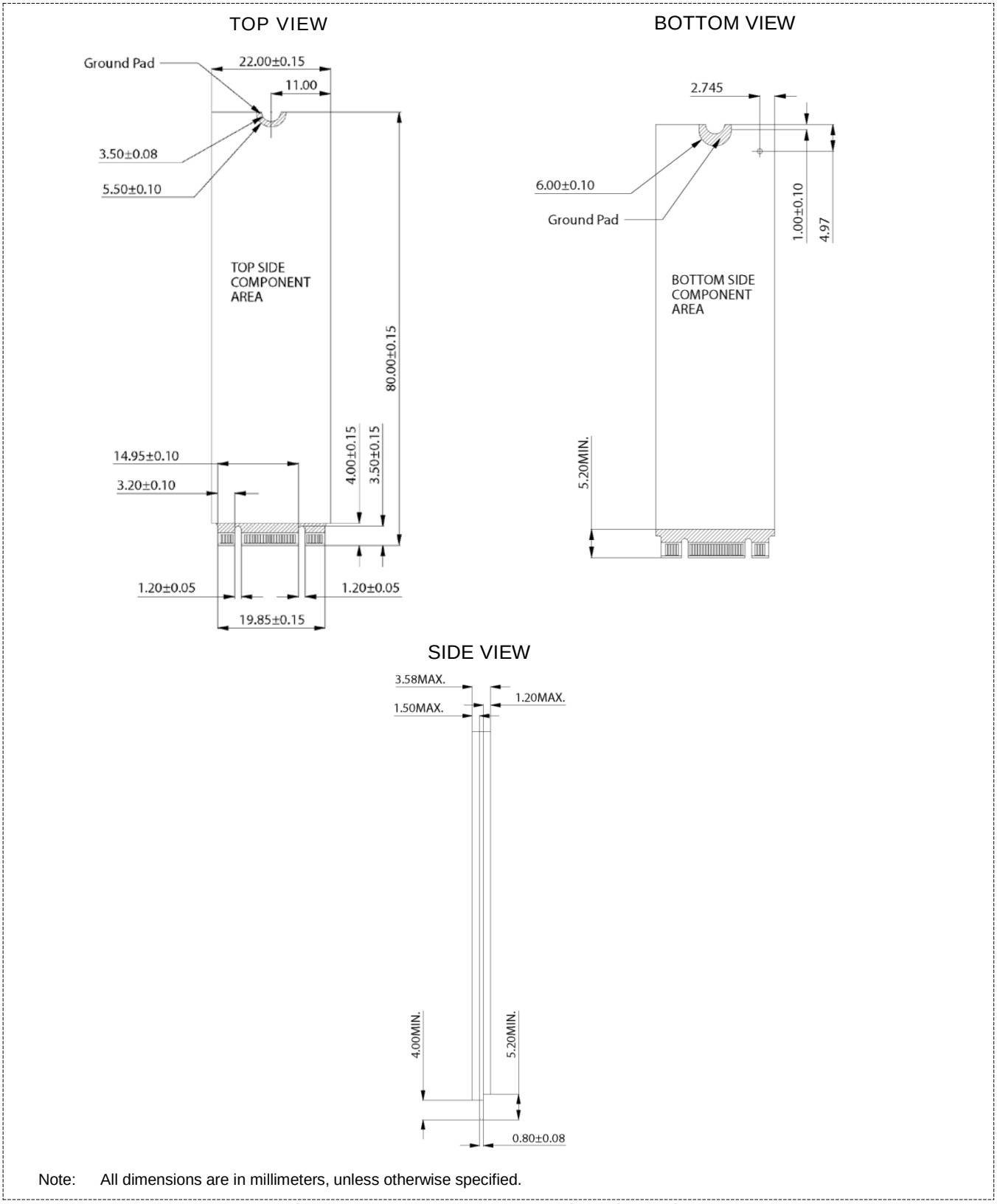
Valid product combinations are those that are in the mass production or will be in the mass production. Consult your Greenliant sales representative to confirm availability of the valid combinations and to determine availability of new product combinations.

Table 3-1: M.2 2280 ArmourDrive Product Valid Ordering Numbers

Capacity	Operating Temperature	Part Number	Form Factor
240GB	Industrial (-40°C to 85°C)	GLS87BQ240G3-I-BD200	2280 (DS), B+M key
	Industrial (-40°C to 85°C)	GLS87BQ240G3-I-CD200	2280 (DS), B+M key
480GB	Industrial (-40°C to 85°C)	GLS87BQ480G3-I-BD200	2280 (DS), B+M key
	Industrial (-40°C to 85°C)	GLS87BQ480G3-I-CD200	2280 (DS), B+M key
960GB	Industrial (-40°C to 85°C)	GLS87BQ960G3-I-BD200	2280 (DS), B+M key
	Industrial (-40°C to 85°C)	GLS87BQ960G3-I-CD200	2280 (DS), B+M key
1.92TB	Industrial (-40°C to 85°C)	GLS87BQ1T923-I-BD200	2280 (DS), B+M key
	Industrial (-40°C to 85°C)	GLS87BQ1T923-I-CD200	2280 (DS), B+M key

© 2019 Greenliant

3.2 Board Diagrams



Note: All dimensions are in millimeters, unless otherwise specified.

Figure 3-1: M.2 2280 ArmourDrive Dimensions

Revision History

Revision	Description	Date
01.000	Initial Release as Factsheet	December 6, 2019

© 2019 Greenliant. All rights reserved.

Greenliant and the Greenliant logo are registered trademarks, and ArmourDrive is a trademark of Greenliant. All other trademarks and registered trademarks are the property of their respective owners.

Specifications are subject to change without notice. Memory sizes denote raw storage capacity; actual usable capacity may be less.

Greenliant makes no warranty for the use of its products other than those expressly contained in the Greenliant Terms and Conditions of Sale.

www.greenliant.com