

Features

- **Industry Standard PCIe Host Interface**
 - PCIe Gen3x4
 - PCI Express Base Revision 3.1 compliant
 - NVMe 1.4c compliant
 - **Performance**
 - Sequential data read: Up to 2,350 MB/s
 - Sequential data write: Up to 1,000 MB/s (measured using 128KB transfer size)
 - **Power Management**
 - 3.3V single power supply
 - Autonomous power state transition (APST)
 - Active state power management (ASPM)
 - Supports L1.2
 - **Power Consumption**
 - Active mode (typical):
 - 1,920GB: 3,300 mW
 - 960GB: 3,260 mW
 - 480GB: 2,740 mW
 - 240GB: 2,690 mW
 - 120GB: 1,870 mW
 - Slumber mode (typical): 60 mW
 - Sleep mode (typical): 4.2 mW
 - **Data Protection**
 - End-to-end data path protection
 - AES-256 encryption engine
 - Hardware Crypto Erase (HCE)
 - Secure erase / Data sanitization
 - Host Controlled Thermal Management (HCMT)
 - Thermal throttling
 - Write protection
 - **Power Loss Notification**
 - **Supports up to 4 Namespaces**
 - **Boot Partition**
 - **Reply Protected Memory Block (RPMB)**
 - **Host Memory Buffer (HMB)**
 - **Volatile Write Cache (VWC)**
 - **Field Firmware Update (FFU)**
 - **Supports SMART and TRIM Commands**
 - **Command Queuing**
 - 1 Admin queue and 8 IO queues supporting up to 128 commands per queue
 - **Dynamic and Static Wear-Leveling**
 - **Bad Block Management**
 - **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: 5K
 - TeraBytes Written (TBW): Up to 5,000
 - **Operating Temperature Range**
 - Industrial: -40°C to 95°C (Tc)
 - **M.2 2280 Form Factor**
 - 22mm x 80mm x 2.38mm (max)
 - Single-sided (SS), M key
 - **All Devices are RoHS Compliant**
- Notes: 1. User capacity: 1GB = 1 billion bytes
2. PCIe = Peripheral Component Interconnect Express
3. NVMe = Non-Volatile Memory Express
4. Tc = Case surface temperature

Product Description

The GLS88AS120G3 / 240G3 / 480G3 / 960G3 / 1T923 Industrial Temperature NVMe M.2 2280 ArmourDrive™ PX Series (referred to as “M.2 ArmourDrive” in this datasheet) are high-performance, high-reliability solid state drives (SSDs). They combine 120, 240, 480, 960 or 1,920 GBytes of NAND flash memory with an advanced NVMe PCIe controller on a printed circuit board (PCB).

The NVMe PCIe SSD controller with built-in advanced NAND management firmware communicates with the host through the standard PCIe interface. It does not require any additional or proprietary software such as the Flash File System (FFS) or 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 ideal for high-reliability industrial and networking systems which need low latency and fast performance.

1.0 GENERAL DESCRIPTION

Each M.2 ArmourDrive module integrates an NVMe PCIe SSD controller with one or two NAND flash multi-chip packages. 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 NVMe PCIe SSD controller, which translates standard PCIe 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 PCIe / NVMe 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.

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 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 Checking and Correction (ECC)

The ECC technology uses advanced 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) support and Hardware cryptographic erase. Secure Erase is an effective method to quickly wipe all data from a PCIe-based SSD using the NVMe protocol (Format NVM). M.2 ArmourDrive's controller supports industrial standard AES-256 encryption to protect sensitive user data. Hardware cryptographic erase resets the cryptographic keys of the M.2 ArmourDrive SSD, making all encrypted user data useless.

2.0 FUNCTIONAL BLOCKS

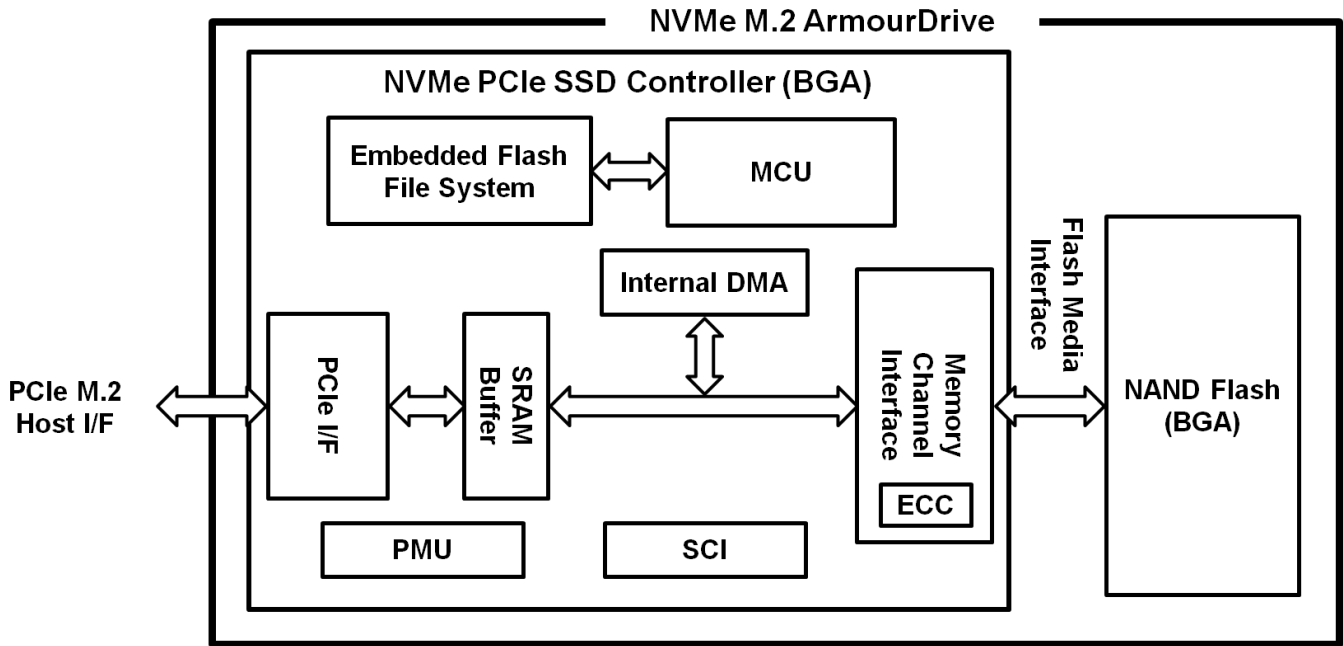
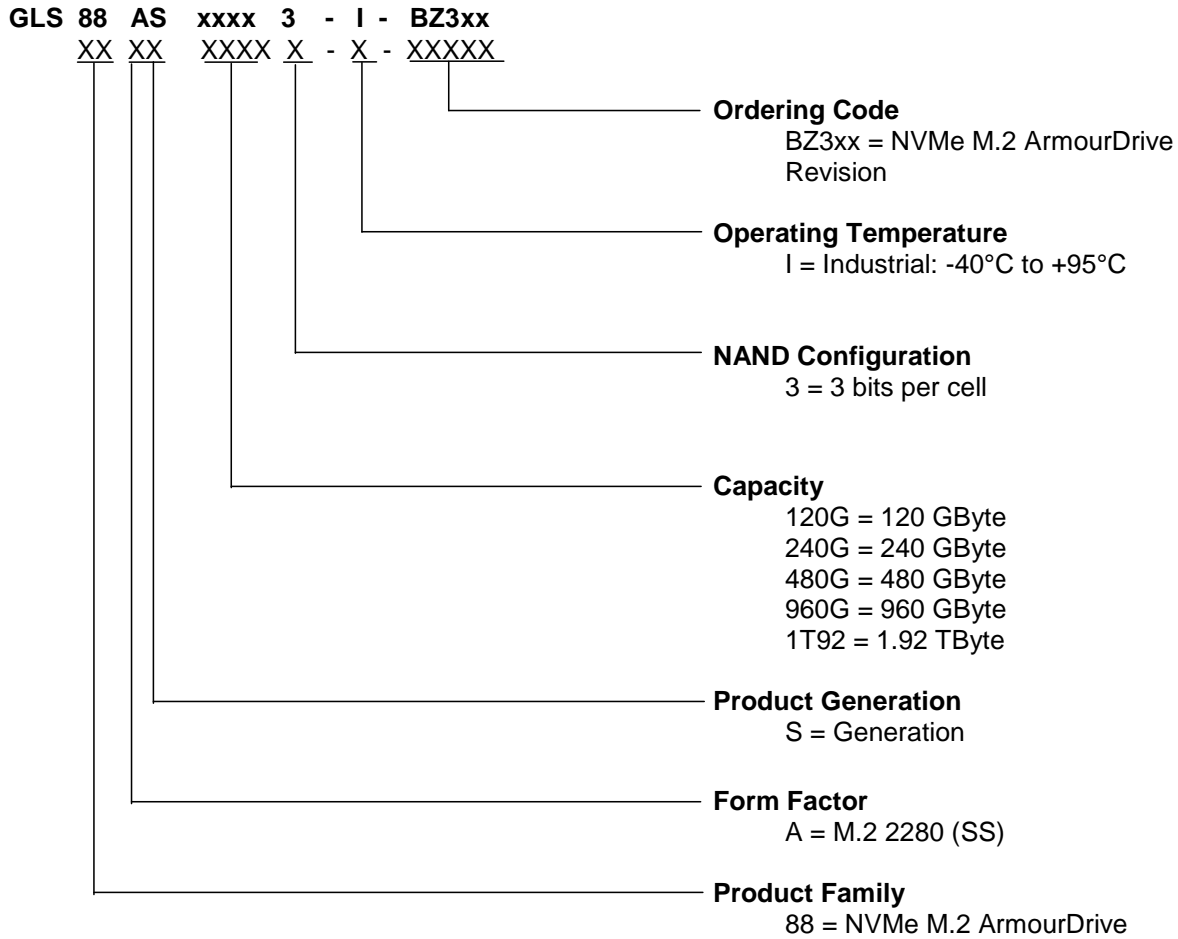


Figure 2-1: M.2 ArmourDrive Block Diagram

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 ArmourDrive Product Valid Ordering Numbers

Capacity	Operating Temperature	Part Number	Form Factor
120GB	Industrial (Tc = -40°C to 95°C)	GLS88AS120G3-I-BZ307	2280 (SS), M key
240GB	Industrial (Tc = -40°C to 95°C)	GLS88AS240G3-I-BZ307	2280 (SS), M key
480GB	Industrial (Tc = -40°C to 95°C)	GLS88AS480G3-I-BZ307	2280 (SS), M key
960GB	Industrial (Tc = -40°C to 95°C)	GLS88AS960G3-I-BZ307	2280 (SS), M key
1,920GB	Industrial (Tc = -40°C to 95°C)	GLS88AS1T923-I-BZ307	2280 (SS), M key

3.2 Board Diagrams

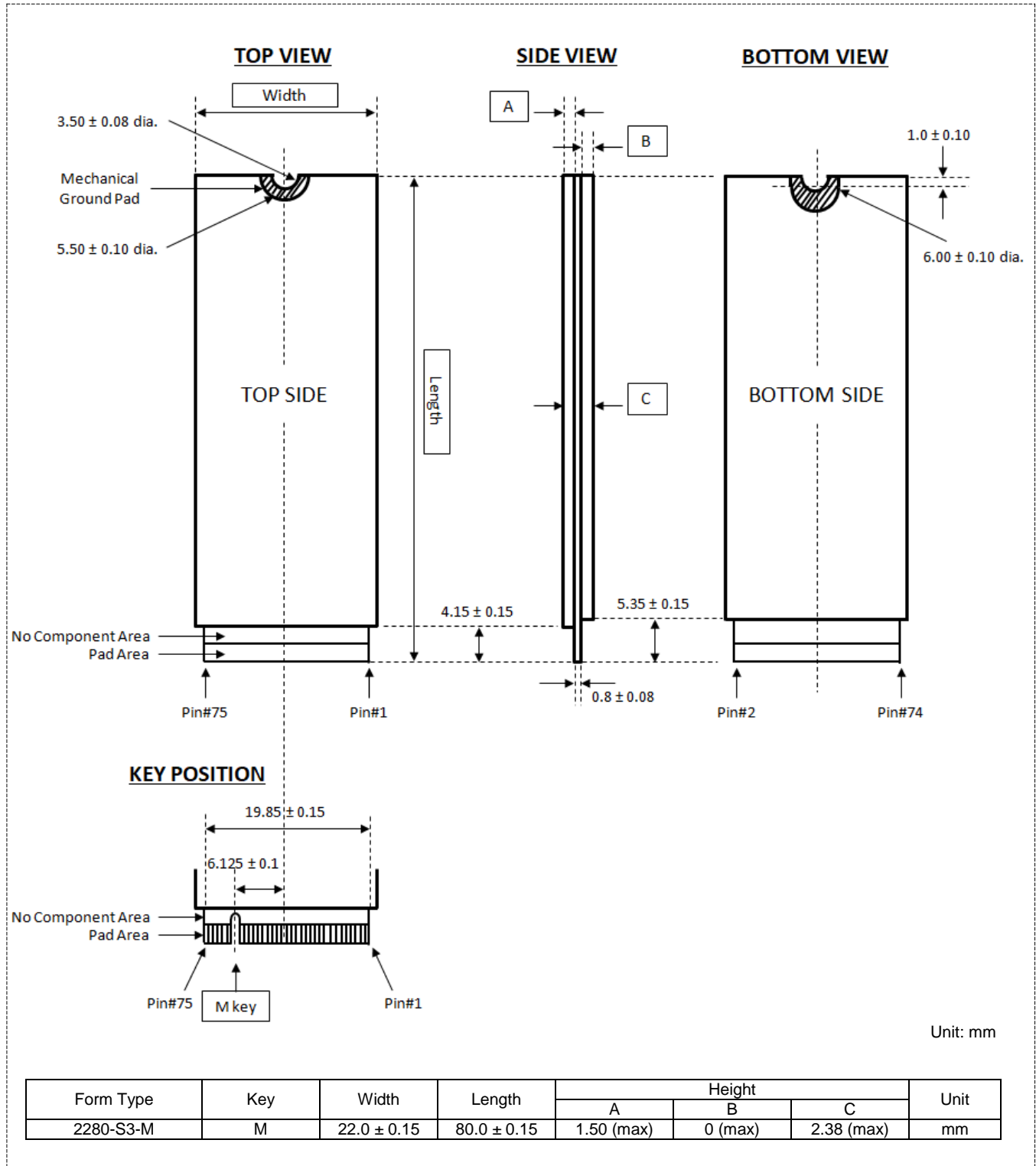


Figure 3-1: NVMe M.2 2280 ArmourDrive Dimensions

Revision History

Number	Description	Date
00.100	Initial Release as Advance Datasheet	July 12, 2024

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