Factsheet 05.000
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 128 KB transfer size)
- **Power Management**
  - 3.3V power supply
  - Host initialized power management (HIPM)
  - Device initialized power management (DIPM)
- **Power Consumption**
  - Active mode:
    1TB: < 1800mW
    512GB: < 1520mW
    256GB: < 1450mW
    128GB: < 1350mW
    64GB: < 1250mW
    32GB: < 1100mW
  - Idle mode: < 325mW
  - Slumber mode: < 15mW
  - DevSleep mode (optional): < 5mW
- **Supports TRIM and SMART Commands**
- **Data Protection**
  - Secure erase / Data sanitization
- **Reliability**
  - Mean Time Between Failures (MTBF): 2 million hours
- **Integrated Current Detector**
  - Protects from inrush current and generates reset during power-up and power-down to prevent inadvertent writes
- **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
  - Commercial: 0°C to 70°C (SSD case temperature reported by SMART)
- **M.2 2242 and 2280 Form Factors**
  - 32GB-256GB: 22mm x 42mm x 3.10mm / 22mm x 80mm x 3.10mm
  - 512GB: 22mm x 42mm x 3.50mm / 22mm x 80mm x 3.50mm
  - 1TB: 22mm x 80mm x 3.50mm
  - Double-sided (DS), B+M key
- **All Devices are RoHS Compliant**

Product Description

The GLS87DP032G3 / 064G3 / 128G3 / 256G3 / 512G3 (2242 form factor) and GLS87BP032G3 / 064G3 / 128G3 / 256G3 / 512G3 / 001T3 (2280 form factor) Industrial and Commercial Temperature SATA M.2 ArmourDrive™ PX Series modules (referred to as "M.2 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).

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.

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1.0 GENERAL DESCRIPTION

Each M.2 ArmourDrive module integrates a SATA SSD controller with 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 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.

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2.0 FUNCTIONAL BLOCKS

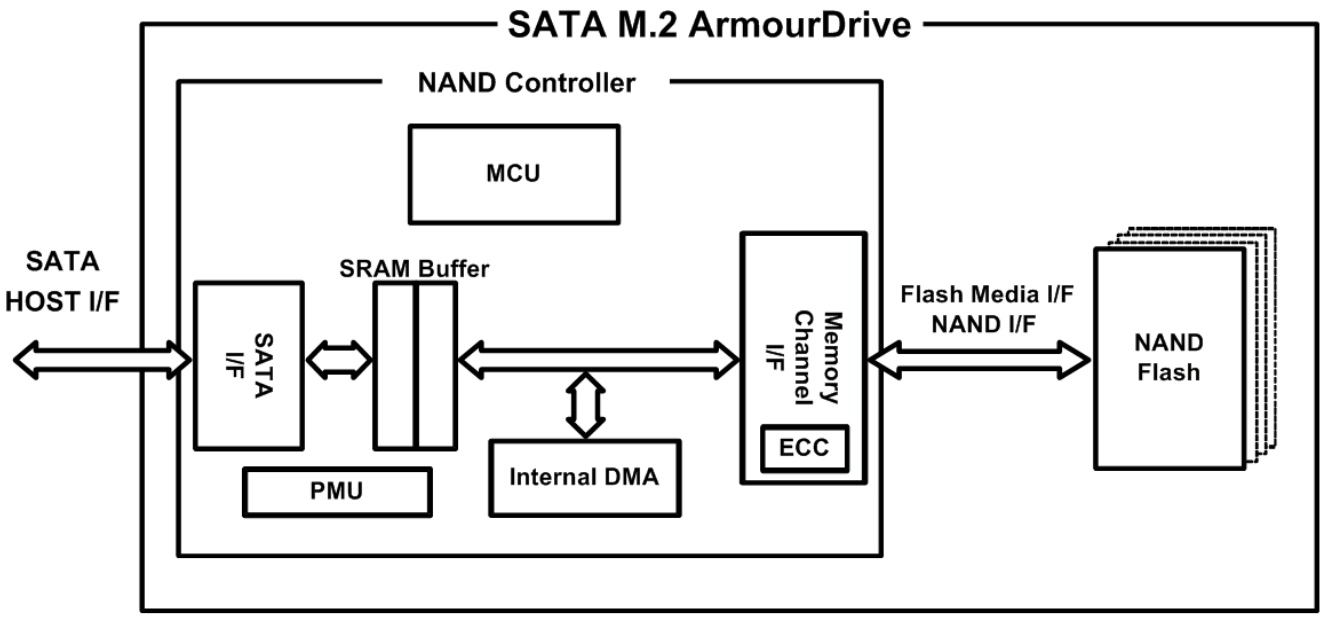


Figure 2-1: M.2 ArmourDrive Block Diagram

3.0 APPENDIX

3.1 Product Ordering Information

GLS 87 BP xxx x3 - I - BZ2xx
XX XX XXX XX - X - XXXXX

Ordering Code
BZ2xx = SATA M.2 ArmourDrive 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
B = M.2 2280 (DS)
D = M.2 2242 (DS)

Product Family
87 = SATA M.2 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: M.2 2242 ArmourDrive Product Valid Ordering Numbers

Capacity	Operating Temperature	Part Number	Form Factor
32GB	Industrial (-40°C to 85°C)	GLS87DP032G3-I-BZ200	2242 (DS), B+M key
32GB	Industrial (-40°C to 85°C)	GLS87DP032G3-I-BZ202	2242 (DS), B+M key
32GB	Commercial (0°C to +70°C)	GLS87DP032G3-C-BZ200	2242 (DS), B+M key
64GB	Industrial (-40°C to 85°C)	GLS87DP064G3-I-BZ200	2242 (DS), B+M key
64GB	Industrial (-40°C to 85°C)	GLS87DP064G3-I-BZ202	2242 (DS), B+M key
64GB	Commercial (0°C to +70°C)	GLS87DP064G3-C-BZ200	2242 (DS), B+M key
128GB	Industrial (-40°C to 85°C)	GLS87DP128G3-I-BZ200	2242 (DS), B+M key
128GB	Industrial (-40°C to 85°C)	GLS87DP128G3-I-BZ202	2242 (DS), B+M key
128GB	Commercial (0°C to +70°C)	GLS87DP128G3-C-BZ200	2242 (DS), B+M key
256GB	Industrial (-40°C to 85°C)	GLS87DP256G3-I-BZ200	2242 (DS), B+M key
256GB	Industrial (-40°C to 85°C)	GLS87DP256G3-I-BZ202	2242 (DS), B+M key
256GB	Commercial (0°C to +70°C)	GLS87DP256G3-C-BZ200	2242 (DS), B+M key
512GB	Industrial (-40°C to 85°C)	GLS87DP512G3-I-BZ200	2242 (DS), B+M key
512GB	Industrial (-40°C to 85°C)	GLS87DP512G3-I-BZ202	2242 (DS), B+M key
512GB	Commercial (0°C to +70°C)	GLS87DP512G3-C-BZ200	2242 (DS), B+M key

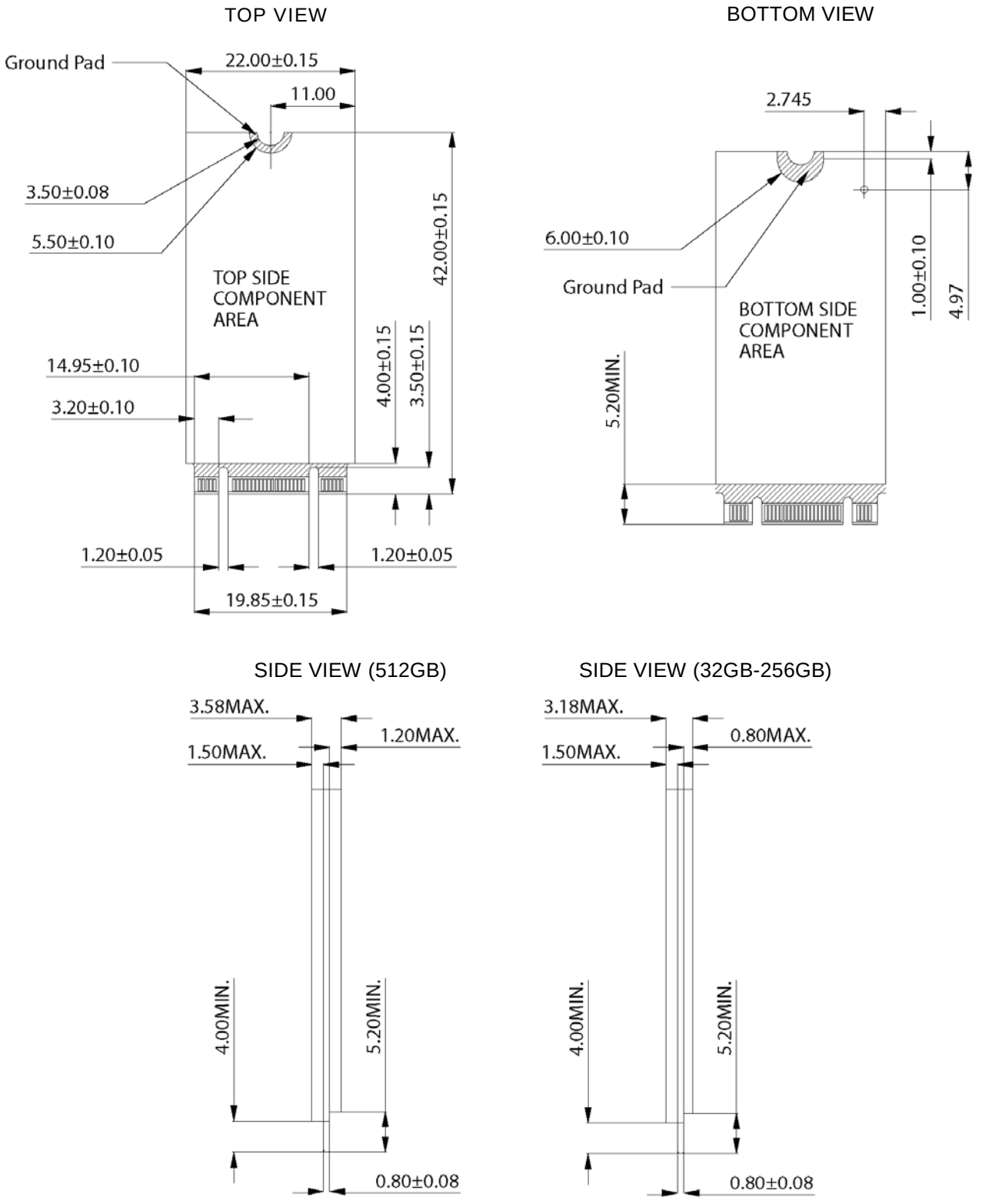
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Table 3-2: M.2 2280 ArmourDrive Product Valid Ordering Numbers

Capacity	Operating Temperature	Part Number	Form Factor
32GB	Industrial (-40°C to 85°C)	GLS87BP032G3-I-BZ200	2280 (DS), B+M key
32GB	Industrial (-40°C to 85°C)	GLS87BP032G3-I-BZ202	2280 (DS), B+M key
32GB	Commercial (0°C to +70°C)	GLS87BP032G3-C-BZ200	2280 (DS), B+M key
32GB	Commercial (0°C to +70°C)	GLS87BP032G3-C-BZ201	2280 (DS), B+M key
64GB	Industrial (-40°C to 85°C)	GLS87BP064G3-I-BZ200	2280 (DS), B+M key
64GB	Industrial (-40°C to 85°C)	GLS87BP064G3-I-BZ202	2280 (DS), B+M key
64GB	Commercial (0°C to +70°C)	GLS87BP064G3-C-BZ200	2280 (DS), B+M key
64GB	Commercial (0°C to +70°C)	GLS87BP064G3-C-BZ201	2280 (DS), B+M key
128GB	Industrial (-40°C to 85°C)	GLS87BP128G3-I-BZ200	2280 (DS), B+M key
128GB	Industrial (-40°C to 85°C)	GLS87BP128G3-I-BZ202	2280 (DS), B+M key
128GB	Commercial (0°C to +70°C)	GLS87BP128G3-C-BZ200	2280 (DS), B+M key
128GB	Commercial (0°C to +70°C)	GLS87BP128G3-C-BZ201	2280 (DS), B+M key
128GB	Commercial (0°C to +70°C)	GLS87BP128G3-C-BZ203	2280 (DS), B+M key
256GB	Industrial (-40°C to 85°C)	GLS87BP256G3-I-BZ200	2280 (DS), B+M key
256GB	Industrial (-40°C to 85°C)	GLS87BP256G3-I-BZ202	2280 (DS), B+M key
256GB	Commercial (0°C to +70°C)	GLS87BP256G3-C-BZ200	2280 (DS), B+M key
256GB	Commercial (0°C to +70°C)	GLS87BP256G3-C-BZ201	2280 (DS), B+M key
256GB	Commercial (0°C to +70°C)	GLS87BP256G3-C-BZ203	2280 (DS), B+M key
512GB	Industrial (-40°C to 85°C)	GLS87BP512G3-I-BZ200	2280 (DS), B+M key
512GB	Industrial (-40°C to 85°C)	GLS87BP512G3-I-BZ202	2280 (DS), B+M key
512GB	Commercial (0°C to +70°C)	GLS87BP512G3-C-BZ200	2280 (DS), B+M key
512GB	Commercial (0°C to +70°C)	GLS87BP512G3-C-BZ201	2280 (DS), B+M key
512GB	Commercial (0°C to +70°C)	GLS87BP512G3-C-BZ203	2280 (DS), B+M key
1TB	Industrial (-40°C to 85°C)	GLS87BP001T3-I-BZ200	2280 (DS), B+M key
1TB	Industrial (-40°C to 85°C)	GLS87BP001T3-I-BZ202	2280 (DS), B+M key
1TB	Commercial (0°C to +70°C)	GLS87BP001T3-C-BZ200	2280 (DS), B+M key
1TB	Commercial (0°C to +70°C)	GLS87BP001T3-C-BZ201	2280 (DS), B+M key

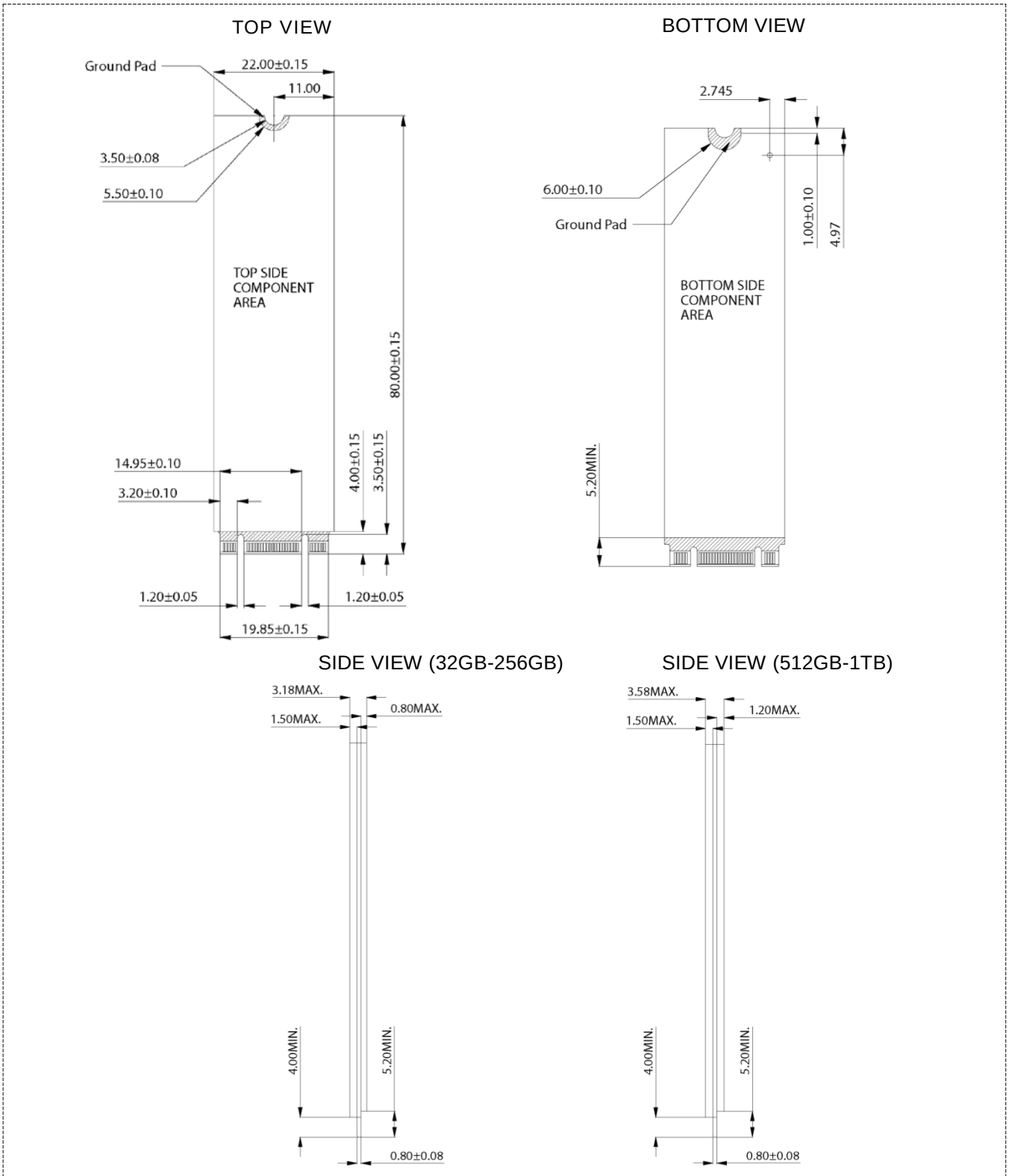
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3.2 Board Diagrams



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

Figure 3-1: M.2 2242 ArmourDrive Dimensions



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

Figure 3-2: M.2 2280 ArmourDrive Dimensions

Revision History

Revision	Description	Date
01.000	Initial release as Factsheet	November 08, 2018
02.000	Added SATA M.2 2242 product information	January 16, 2019
02.001	Updated Product Description (page 1) and Power Interrupt Data Protection (section 1.1.5)	January 30, 2019
03.000	Added Commercial Temperature part numbers; Updated Features descriptions on page 1; Updated Table 3-1 and 3-2	June 13, 2019
03.001	Updated Features descriptions on page 1	July 26, 2019
04.000	Added BZ201 part numbers; Updated Power Consumption on page 1	November 27, 2019
05.000	Updated Features descriptions on page 1; Added BZ202 and BZ203 part numbers	April 29, 2020

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