# G7200 EX Series
## NVMe U.2 EnduroSLC™ Industrial Enterprise SSD

**Greenliant**®

## Features

- **User Capacities**
  – 800GB, 960GB, 1.6TB, 1.92TB
- **Industry Standard PCIe Host Interface**
  – PCIe 3.0x4
  – Compatible with NVM Express (NVMe) 1.2
  – Supports UEFI boot, Expansion ROM
  – Hot pluggable
- **Sequential Performance**
  – Read: up to 2600MB/s
  – Write: up to 1900MB/s
- **Random Performance**
  – Read (4KB): up to 600K IOPS
  – Write (4KB): up to 160K IOPS
- **Performance Consistency**
  – Read/Write: up to 90%/90% (99.9%)
- **Latency**
  – Sequential read/write: 50µs/20µs (typical)
  – Random read/write: 105µs/20µs (typical)
- **Quality of Service**
  – Read/Write: 120µs/90µs (99.0%)
  – Read/Write: 200µs/300µs (99.99%)
- **Power Specifications**
  – 12V power supply
  – Active mode: 10W
  – Support 3 mode power supply (25W/20W/15W)
- **Operating System Compatibility**
  – CentOS 6.5/7.0/7.4/7.5 64-bit
  – RHEL 6.5/7.0/7.4/7.5 64-bit
  – MS Windows Server 2008/2012/2016 64-bit
  – VMware ESXi 6.0/6.5/7.0
  – 中标麒麟NeoKylin
  – 深度 操作系统Deepin

- **Lifetime Endurance**
  – 30 Drive Writes Per Day (DWPD) for 5 years
- **Data Retention**
  – 10 years at <10% of SSD endurance used; 1 year at 100% of SSD endurance used
- **Reliability**
  – Built-in ECC
  – Unrecoverable Bit Error Rate (UBER): < 1 sector per $10^{27}$ bits read, enhanced by RAID
  – Static and Dynamic Wear Leveling
  – On-Chip Adaptive RAID provides reliable failover
  – Read-only mode support when there is not enough reserved drive space
  – Dedicated power interrupt data protection
- **Data Security**
  – AES 256-bit encryption
  – End-to-end data path protection (local CRC)
  – Secure Erase (data sanitization)
- **512B/4KB Sector Support**
- **Supports SMART and TRIM Commands**
- **NAND Configuration**
  – 1 bit per cell (SLC)
  – Designed with Greenliant's advanced EnduroSLC™ Technology
- **Operating Temperature Range**
  – Industrial: -40°C to +85°C
- **2.5-inch Form Factor**
  – 100.45mm x 69.85mm x 9.00mm
- **CE and FCC Certifications**
- **All Devices are RoHS Compliant**

## Product Description

The G7200 industrial enterprise NVMe U.2 EX Series (referred to as "U.2 Industrial Enterprise SSD" in this factsheet) are ultra-high endurance, high performance and high reliability solid state drives, built with NAND flash memory, DRAM and an advanced PCIe NVMe controller in a standard 2.5-inch form factor housing.

U.2 Industrial Enterprise SSD, designed with Greenliant's advanced EnduroSLC Technology, is well suited for write-intensive applications, such as aviation, rail transportation, marine equipment, seismic instrumentation, data loggers, base stations, industrial control and factory automation. All EnduroSLC-based products operate at industrial temperatures, between -40 and +85 degrees Celsius.

Greenliant's PCIe SSD controller with built-in advanced NAND management firmware communicates with the host through the NVMe protocol. The firmware effectively optimizes the use of NAND flash memory's program/erase (P/E) cycles, improves endurance, enhances data security and minimizes write amplification, extending the lifespan of aging NAND and achieving the longest device lifetime possible.

U.2 Industrial Enterprise SSD's On-Chip Adaptive RAID technology helps seamless data recovery when NAND page, block, or die failure is encountered. Greenliant's NAND management technology combines robust 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.

## 1.0   GENERAL DESCRIPTION

Each U.2 Industrial Enterprise SSD integrates a PCIe NVMe SSD controller with NAND flash multi-chip packages and DRAM in standard 2.5-inch form factor housing.

## 1.1   EnduroSLC™ Technology

EnduroSLC™ is a proprietary 3D NAND management technology developed by Greenliant for high reliability applications requiring ultra-high endurance and superior data retention. Using 1-bit-per-cell (SLC) NAND configuration, EnduroSLC enabled SSDs are ideal for write-intensive applications used in extreme temperature, high stress environments. EnduroSLC enabled solid state drives offer a high reliability flash storage solution with ultra-high write endurance that exceeds capabilities of legacy, planar SLC NAND based products.

## 1.2   Power Interrupt Data Protection

Power Interrupt Data Protection is a mechanism to help prevent data corruption during unexpected power failure events. In addition to hardware based power loss detection and capacitive data protection, 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.

## 1.3   On-Chip Adaptive RAID

By default, U.2 Industrial Enterprise SSD uses 15+1 RAID. When an uncorrectable read error occurs in one NAND die, the data will not be lost, and can be reconstructed from the data on the other 15 NAND die in the same RAID Group (RG). Afterwards, the affected RG is seamlessly reconfigured adaptively to ensure new data are continuously protected under the reconfigured RG without affecting the user capacity.

## 1.4   Advanced NAND Management

U.2 Industrial Enterprise SSD's PCIe 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.

## 1.5   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 PCIe-based SSD using the NVMe protocol. Cryptographic erase resets the cryptographic key of an encrypted SSD making all stored user data useless. U.2 Industrial Enterprise SSD's controller supports industry standard AES-256 encryption to protect sensitive user data.

## 2.0    APPENDIX

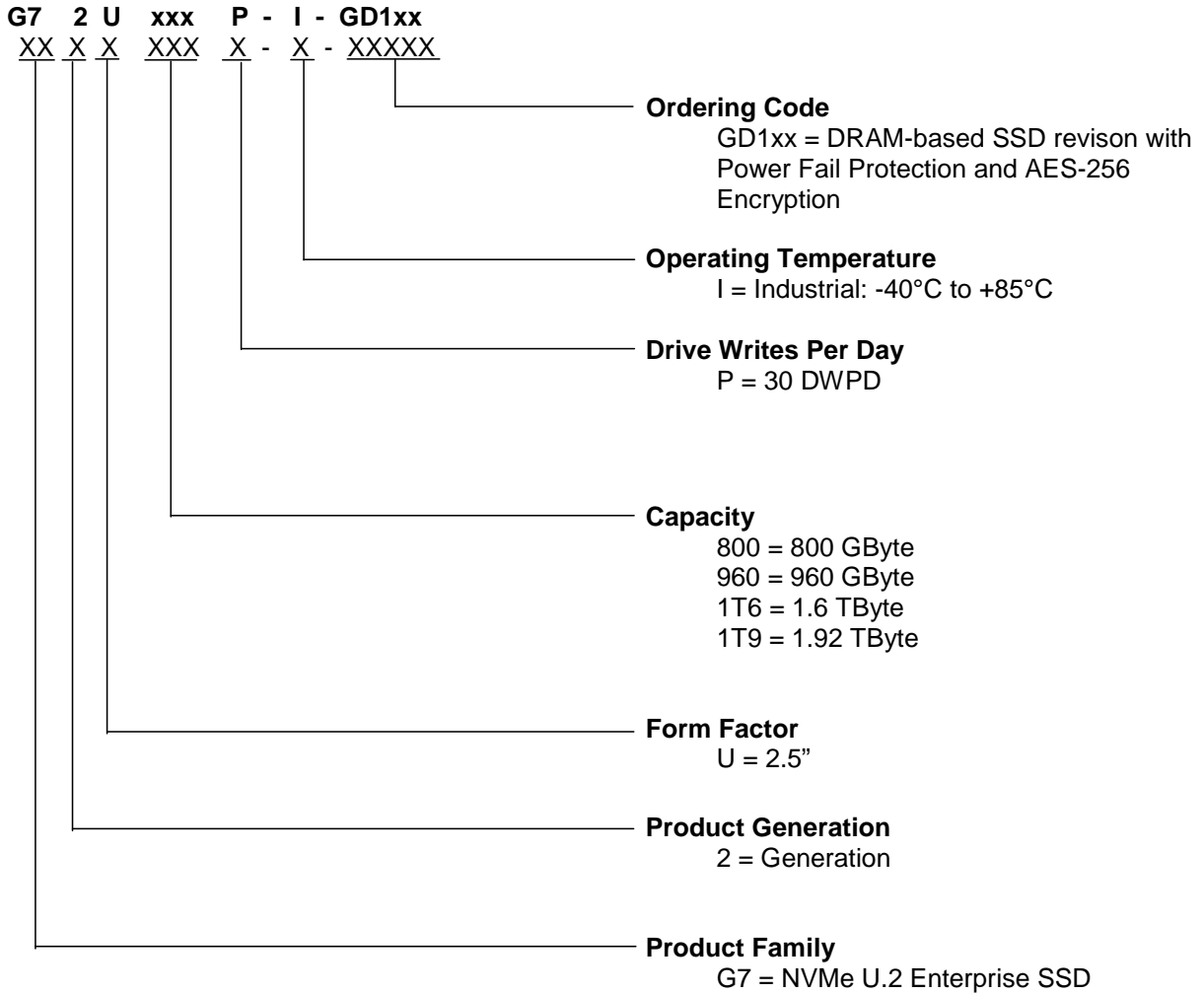## 2.1    Product Ordering Information

```
G7  2 U  xxx  P - I - GD1xx
XX  X X  XXX  X - X - XXXXX
```

**Ordering Code**
GD1xx = DRAM-based SSD revison with Power Fail Protection and AES-256 Encryption

**Operating Temperature**
I = Industrial: -40°C to +85°C

**Drive Writes Per Day**
P = 30 DWPD

**Capacity**
800 = 800 GByte
960 = 960 GByte
1T6 = 1.6 TByte
1T9 = 1.92 TByte

**Form Factor**
U = 2.5"

**Product Generation**
2 = Generation

**Product Family**
G7 = NVMe U.2 Enterprise SSD

**Table 2-1: NVMe U.2 Industrial Enterprise SSD Product Valid Ordering Numbers**

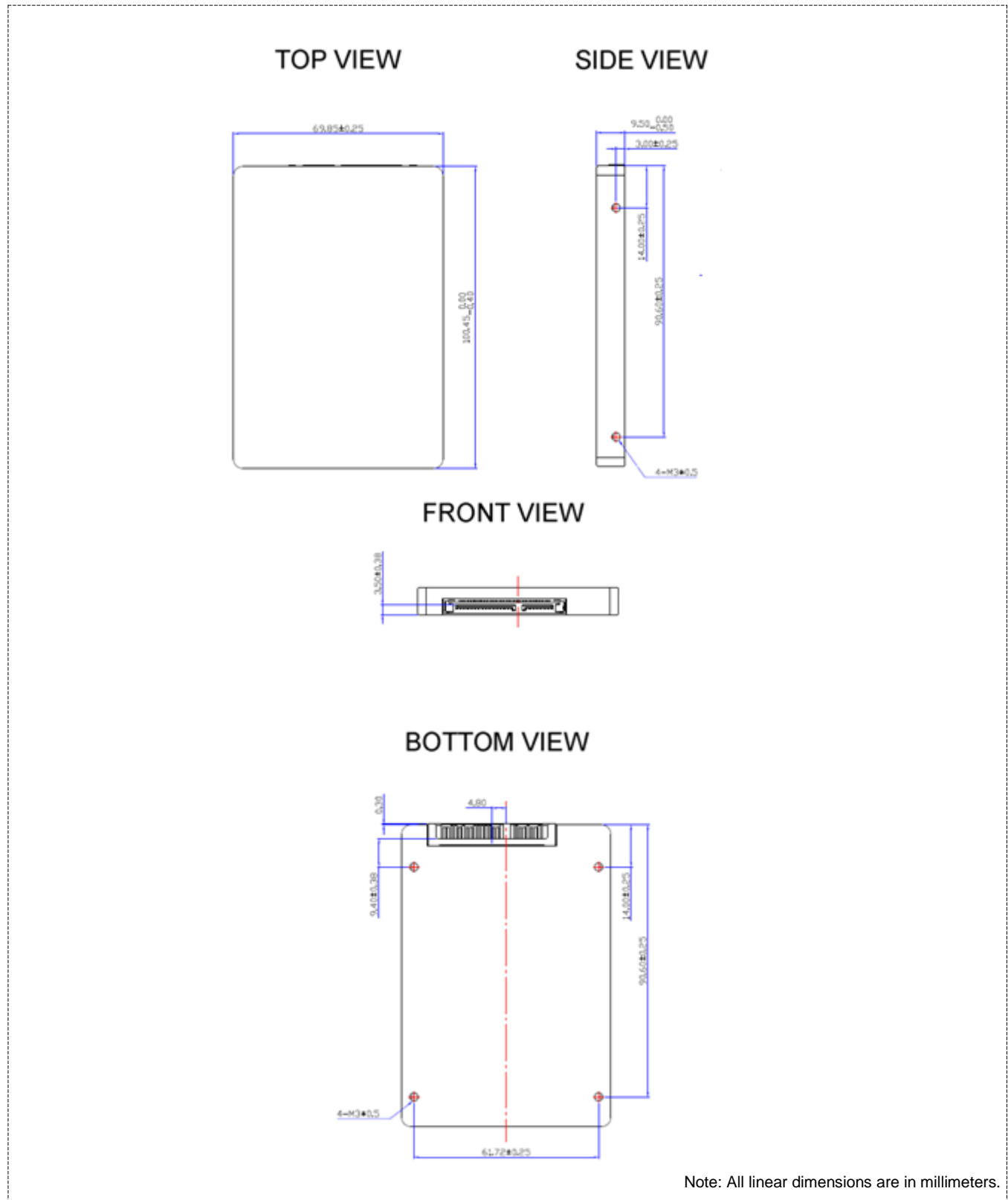| Capacity | Operating Temperature | Part Number | Form Factor |
|---|---|---|---|
| 800GB | Industrial (-40°C to 85°C) | G72U800P-I-GD104 | 2.5-inch |
| 960GB | Industrial (-40°C to 85°C) | G72U960P-I-GD104 | 2.5-inch |
| 1.6TB | Industrial (-40°C to 85°C) | G72U1T6P-I-GD104 | 2.5-inch |
| 1.92TB | Industrial (-40°C to 85°C) | G72U1T9P-I-GD104 | 2.5-inch |

## 2.2 Mechanical Diagrams



**Figure 2-1: NVMe U.2 Industrial Enterprise SSD Dimensions**