

RoHS Compliant

Solid State Drive

Apacer Professional PCIe Gen3 x4 M.2 2280 NAS SSD Product Specifications

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Version 1.3

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Specifications Overview:

- **PCIe Interface**
 - Compliant with NVMe 1.3
 - Compatible with PCIe Gen3 x4 interface
- **Capacity**
 - 128, 256, 512 GB
 - 1 TB
- **Performance***
 - Burst read/write: 600 MB/sec
 - Sequential read: Up to 2,500 MB/sec
 - Sequential write: Up to 2,100 MB/sec
 - Random read (4K): Up to 215,000 IOPS
 - Random write (4K): Up to 390,000 IOPS
- **Flash Management**
 - Flash bad-block management
 - S.M.A.R.T.
 - Power Failure Management
 - TRIM
- **NAND Flash Type: 3D TLC**
- **MTBF: > 2,000,000 hours**
- **Endurance (in Terabytes Written: TBW)**
 - 128 GB: 250 TBW
 - 256 GB: 500 TBW
 - 512 GB: 1,000 TBW
 - 1 TB: 2,000 TBW
- **Temperature Range**
 - Operating: 0°C to 70°C
 - Storage: -40°C to 85°C
- **Supply Voltage**
 - 3.3 V ± 5%
- **Power Consumption***
 - Active mode: 3,680 mW
 - Idle mode: 70 mW
- **Connector Type**
 - 75-pin M.2 module pinout
- **Form Factor**
 - M.2 2280-S2-M
 - Dimensions: 80.00 x 22.00 x 2.15, unit: mm
- **RoHS Compliant**
- **Warranty: 5 years or TBW (whichever occurs first)**

*Varies from capacities. The values for performances and power consumptions presented are typical and may vary depending on flash configurations or platform settings. The term idle refers to the standby state of the device.

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1. Product Specifications

1.1 Performance

Performance of Apacer Professional PCIe M.2 2280 is listed below in Table 1-1.

Table 1-1 Performance Specifications

Capacity	128 GB	256 GB	512 GB	1 TB
Performance				
Sequential Read* (MB/s)	2,200	2,300	2,500	2,500
Sequential Write* (MB/s)	600	1,200	2,100	2,100
Random Read IOPS** (4K)	85,000	150,000	210,000	215,000
Random Write IOPS** (4K)	130,000	240,000	380,000	390,000

Note:

Results may differ from various flash configurations or host system setting.

*Sequential performance is based on CrystalDiskMark 5.2.1 with file size 1,000MB.

**Random performance measured using IOMeter with Queue Depth 32.

1.2 Environmental Specifications

Environmental specifications of Apacer Professional PCIe M.2 2280 are shown in Table 1-2.

Table 1-2 Environmental Specifications

Environment	Specifications
Temperature	0°C to 70°C (Operating)
	-40°C to 85°C (Non-operating)
Vibration	Non-operating: Sine wave, 15(G), 10~2000(Hz), Operating: Random, 7.69(GRMS), 20~2000(Hz)
Shock	Non-operating: Acceleration, 1,500 G, 0.5 ms Operating: Peak acceleration, 50 G, 11 ms

1.3 Mean Time Between Failures (MTBF)

Mean Time Between Failures (MTBF) is predicted based on reliability data for the individual components in Apacer Professional PCIe M.2 2280. The prediction result for Apacer Professional PCIe M.2 2280 is more than 2,000,000 hours.

Note: The MTBF is predicated and calculated based on “Telcordia Technologies Special Report, SR-332, Issue 2” method.

1.4 Endurance

The endurance of a storage device is predicted by TeraBytes Written based on several factors related to usage, such as the amount of data written into the drive, block management conditions, and daily workload for the drive. Thus, key factors, such as Write Amplifications and the number of P/E cycles, can influence the lifespan of the drive.

Table 1-3 Endurance Specifications

Capacity	TeraBytes Written
128 GB	250
256 GB	500
512 GB	1,000
1 TB	2,000

Note:

- The endurance of SSD could be estimated based on users' behaviors, NAND endurance cycles, and write amplification factor. It is not guaranteed by the flash vendor.
- TBW may vary from flash configuration and platform.

1.5 Certification and Compliance

Apacer Professional PCIe M.2 2280 complies with the following standards:

- CE
- FCC
- RoHS

2. Flash Management

2.1 Bad Block Management

Current production technology is unable to guarantee total reliability of NAND flash memory array. When a flash memory device leaves factory, it comes with a minimal number of initial bad blocks during production or out-of-factory as there is no currently known technology that produce flash chips free of bad blocks. In addition, bad blocks may develop during program/erase cycles. Since bad blocks are inevitable, the solution is to keep them in control. Apacer flash devices are programmed with ECC, block mapping technique and S.M.A.R.T to reduce invalidity or error. Once bad blocks are detected, data in those blocks will be transferred to free blocks and error will be corrected by designated algorithms.

2.2 S.M.A.R.T.

S.M.A.R.T. is an abbreviation for Self-Monitoring, Analysis and Reporting Technology, a self-monitoring system that provides indicators of drive health as well as potential disk problems. It serves as a warning for users from unscheduled downtime by monitoring and displaying critical drive information. Ideally, this should allow taking proactive actions to prevent drive failure and make use of S.M.A.R.T. information for future product development reference.

2.3 Power Failure Management

Power Failure Management plays a crucial role when power supply becomes unstable. Power disruption may occur when users are storing data into the SSD, leading to instability in the drive. However, with Power Failure Management, a firmware protection mechanism will be activated to scan pages and blocks once power is resumed. Valid data will be transferred to new blocks for merging and the mapping table will be rebuilt. Therefore, data reliability can be reinforced, preventing damage to data stored in the NAND Flash.

2.4 TRIM

TRIM, though in capital letters usually, is a memory computation command rather than an abbreviation. It is mainly a SATA command that enables the operating system to inform the SSD (Solid State Drive) which blocks of previously stored data are no longer valid, due to erases by the host or operating system, such as file deletions or disk formatting. Once notified, SSD will begin the discard of the invalid LBAs and retain more space for itself, in fact, the discarded is no longer recoverable.

When an LBA is replaced by the operating system, as with overwrite of a file, the SSD is informed that the originally occupied LBA is determined as no longer in use or invalid. The SSD will not save those blocks in garbage collected sectors. Noticeably, a file deletion command by host or operating system never actually erases the actual content, but marks the file as deleted. This issue is even specifically noticeable for flash based memory devices, such as SSDs. In fact, an SSD will keep garbage collecting the invalid, previously occupied LBAs, if it is not informed that these LBAs can be erased. Thus, the SSD would experience a significant performance downfall.

3. Electrical Specifications

3.1 Operating Voltage

Table 3-1 lists the supply voltage for Apacer Professional PCIe M.2 2280.

Table 3-1 Operating Range

Item	Range
Supply Voltage	3.3V ± 5%

3.2 Power Consumption

Table 3-2 lists the power consumption for Apacer Professional PCIe M.2 2280.

Table 3-2 Power Consumption

Capacity Mode	128 GB	256 GB	512GB	1 TB
Active (mW)	3,150	3,450	3,520	3,680
Idle (mW)	70	70	70	70

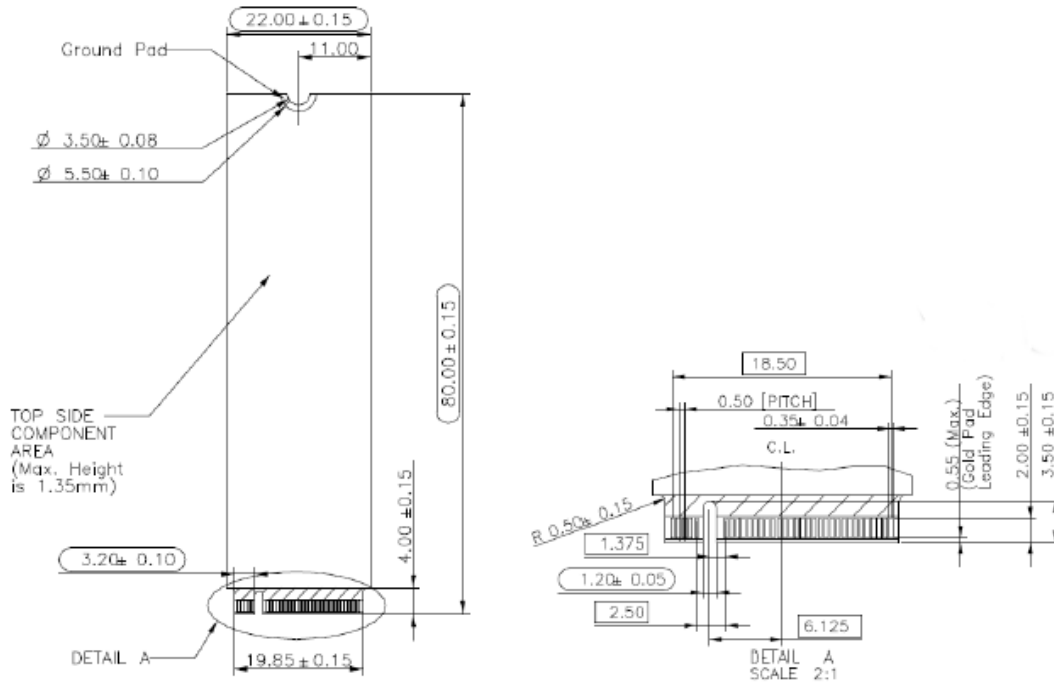
Note:

*All values are typical and may vary depending on flash configurations or host system settings.

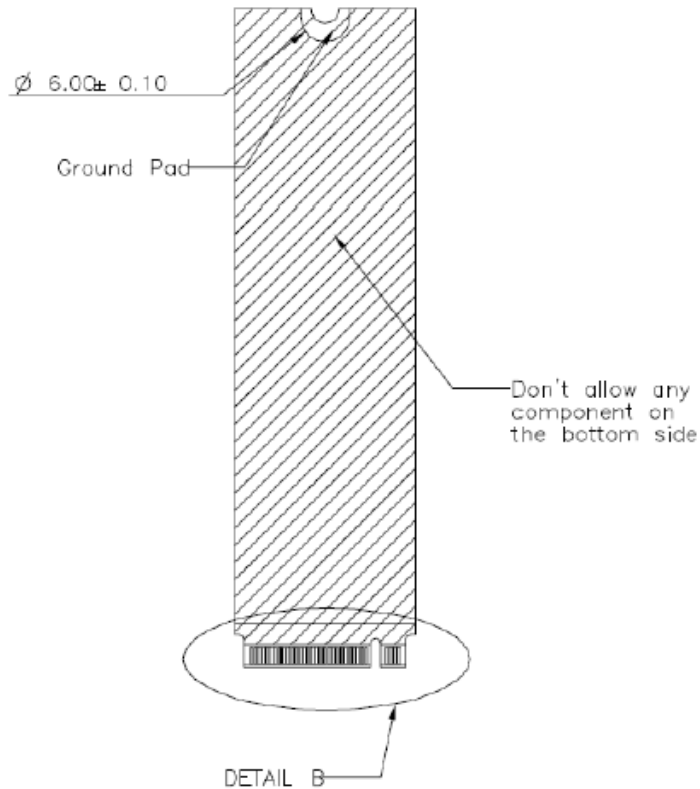
**Active power is an average power measurement performed using CrystalDiskMark with 128KB sequential read/write transfers.

4. Physical Characteristics

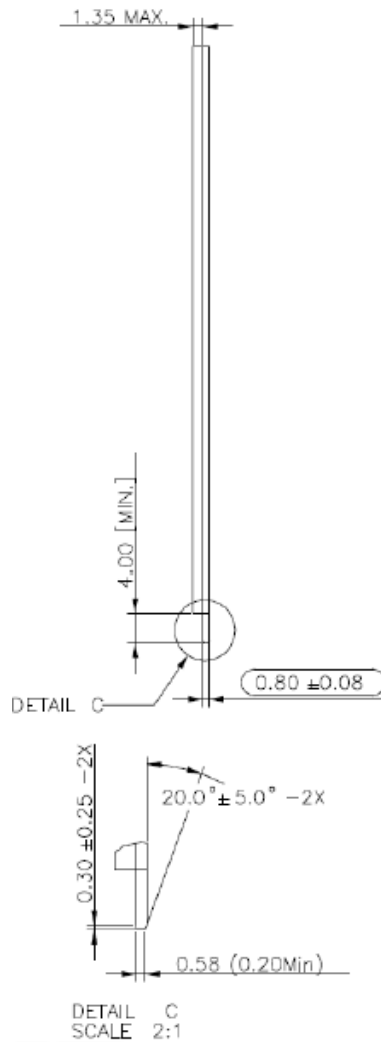
Top View



Bottom View



Side View



Notes :

1. = Max Component Height
2. = No Component
3. = No Component / Signal Vias / Signal Copper / Printing
4. General Tolerance $\pm 0.15\text{mm}$
5. are critical dimensions

Figure 4-1 Physical Dimensions

5. Product Ordering Information

Capacity	Retail P/N
128GB	AP128GPP3480-R
256GB	AP256GPP3480-R
512GB	AP512GPP3480-R
1TB	AP1TPP3480-R

Note: Valid combinations are those products in mass production or will be in mass production. Consult your Apacer sales representative to confirm availability of valid combinations and to determine availability of new combinations.

Revision History

Revision	Description	Date
1.0	Initial release	6/17/2020
1.1	Updated Endurance on Specifications Overview page and 1.4 Endurance	6/23/2020
1.2	Updated warranty period from 3 years to 5 years on Specifications Overview page	8/4/2020
1.3	Updated MTBF on Specifications Overview page and 1.3 Mean Time Between Failures (MTBF) by changing it from >1,500,000 hours to >2,000,000 hours	8/14/2020

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