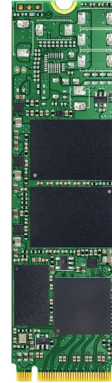# Kanaga M.2 Type 2280 Solid-State Drive

PCIe Gen3 x4 / NVMe 1.3 - Series 6, 3D TLC, Industrial

KGPM28ADCI

Datasheet - Rev. 1.0

1. Description

SunChip's Kanaga Series 6 M.2 NVMe PCIe solid-state drive (SSD) technology is a performance-oriented solution designed for the unique storage demands and workload requirements of a broad range of industrial embedded systems, including communications equipment, industrial automation, medical imaging, transportation control, and data recorders where read and write demands are higher than typical boot or mixed workload solutions. Kanaga Series 6 M.2 NVMe PCIe solid-state drives are mainstream productivity solutions designed to provide the ideal balance of power, performance, endurance, reliability, long ordering life, and cost all in a rugged industrial design suitable for environmental extremes.

Features

Capacity
- 240GB, 480GB, 960GB

NAND: 3D TLC

Sequential Performance[1]
- 128kB Sequential Read: 2,050 MB/s
- 128kB Sequential Write: 1,950 MB/s

Random Performance[1]
- 4kB IOPS Read: up to 287,000
- 4kB IOPS Write: up to 265,000

Power[1]: 3.3V±5%
- 128kB Sequential Read: 3.6 W
- 128kB Sequential Write: 3.7 W
- 4kB Random Read: 3.3 W
- 4kB Random Write: 2.8 W
- Idle: 0.6 W

Temperature Ranges
- Industrial: -40ºC to 85ºC
- Non-Operating: -40ºC to 85ºC

Reliability
- Advanced LDPC ECC
- MTBF: >2M hours

Endurance[1]
- JESD219A: 700 TBW
- Sequential: 2,980 TBW

vtGuard® Power Fail Protection
- Integrated power fail protection
- Preserves static data in the event of power failure
- Cache/buffer contents restored at power-on

SMART Attribute Reporting
- Monitors device health
- Anticipates and predicts failures

Mechanical Dimensions
- M.2 Type 2280-D2-M Form Factor
- Module with head spreader
  Length x Width x Height mm (inches)
  80.00 (3.14) x 22.00 (0.866) x 3.00 (0.118) max

Compliance
- PCIe Specification, Revision 3.1a
- NVMe Specification, Revision 1.3
- FCC, CE, UL, RoHS, WEEE

Environmental (Non-operating)
- Humidity (non-condensing): 5% to 95%
- Shock: 1500G, half-sine wave, 0.5ms duration

Data Security
- Integrated AES-256 encryption (data-at-rest)
- Sanitize Crypto Erase
- Sanitize Block Erase
- TCG/ Opal 2.0-compliant SED (Option)

(1)   Based on the 960GB device

Electrostatic Discharge (ESD) can damage this device. When handling the device, always wear a grounded wrist strap and use a static dissipative surface.

Heat Mitigation Option Described in Addendum

Any damage to the unit that occurs after its removal from the shipping package and ESD protective bag is the responsibility of the user.

2. Specifications

Interface

Interface	PCIe 3.1a, NVMe 1.3
Interface speed	8GT/s (PCIe Gen3 x4)

Capacity

Unformatted Capacity (GB)[1]	User-Addressable LBA[2]	User-Addressable Capacity Bytes
240	468,862,128	240,057,409,536
480	937,703,088	480,103,981,056
960	1,875,385,008	960,197,124,096
(1) 1GB = 1,000,000,000 bytes. LBA: Logical Block Address; Logical Block Size = 512 Bytes/1 Sector. (2) LBA: Logical Block Address; Logical Block Size = 512 Bytes/1 Sector.		

Performance

Capacity (GB)	Performance Throughput[1] 128kB File, Queue Depth (QD) = 32		IOPS[1] 4kB File, Queue Depth (QD) = 32	
	Sequential Read MB/s	Sequential Write MB/s	100% Random Read	100% Random Write
240	1,989	1,180	100,800	159,600
480	2,132	1,768	195,700	257,800
960	2,050	1,950	287,000	265,000
(1) Performance is based on fresh out-of-box condition formatted with NTFS filesystem and running CrystalDiskMark 8.0.0 with file size 1024MB. Actual results may vary depending on file system, workload, and SSD condition.				

Power Consumption - 3.3V Supply

Capacity (GB)	Sequential Read[1] 128kB, QD = 32	Sequential Write[1] 128kB, QD = 32	Random Read[1] 4kB, QD = 32	Random Write[1] 4kB, QD = 32	Idle	Unit
240	3.4	2.4	2.3	2.2	0.6	W
480	3.5	2.8	2.6	2.5	0.6	W
960	3.6	3.7	3.3	2.8	0.6	W
(1) Power consumption tests were done using Oakgate test system at 25ºC						

Temperature and Humidity

Part Number	Operating Temperature	Non-Operating [1] Temperature	Humidity (Non-Condensing)
KGPM28ADCIxxx-0011	-40ºC to 85ºC	-40ºC to 85ºC	5% to 95%
(1) Maximum non-operating temperature assumes data is stored on the SSD. Temperatures above 85ºC are beyond NAND specification for data retention. Please see *Temperature Considerations for Industrial Embedded SSDs* whitepaper under the industrial SSD section of Virtium website (Virtium.com)			

Shock and Vibration

Reliability	Test Conditions	Reference Standards
Shock	1500G, half-sine wave, 0.5ms duration	JESD22-B110B.01
Vibration	20G, 20 Hz to 2000 Hz	JESD22-B103B.01

3. Reliability

Endurance

Capacity (GB)	JESD218A[1] & JESD219 Enterprise Workloads		100% Sequential Workloads	
	Total Bytes Written TBW (TB)	Drive Writes per day (3 years)	Total Bytes Written TBW (TB)	Drive Writes per day (3 years)
240	175	0.66	763	2.90
480	293	0.55	1529	2.90
960	700	0.66	2980	2.83
(1) JESD218A assumes an active temperature at 55°C and a retention temperature at 40°C				

Mean Time Between Failures (MTBF)

The SSD achieves a MTBF of greater than 2,000,000 hours predicted and is derived from the component reliability data using Telcordia SR-332 methods at 40°C and tested under standard environmental operating conditions.

vtGuard® Power-Fail Protection

vtGuard is an integrated power failure protection technology that will preserve data on the SSD if a sudden power failure should occur. It will also transfer the write cache (metadata, mapping tables) contents to the non-volatile flash and restore the contents upon power restoration. This data will be preserved regardless of the duration of the power failure event. This technology also ensures that the SSD will be recoverable after sudden power failure events although a rebuild of the mapping tables may delay readiness of the SSD on the ensuing power cycle on larger capacities.