KP60-25-01

KINGPINS® SOLID-STATE DRIVE

SATA6.0Gbps 2.5 3D TLC

KP60 Series

Product Specification

KINGPINS TECH CO.,LIMITED

Revision

Revision	Date	Description
00	Oct. 2023	Initial Release
01	Sep. 2024	Upgrade NAND FLASH
02	Mar. 2025	Delete Secure Erase Feature

Feature

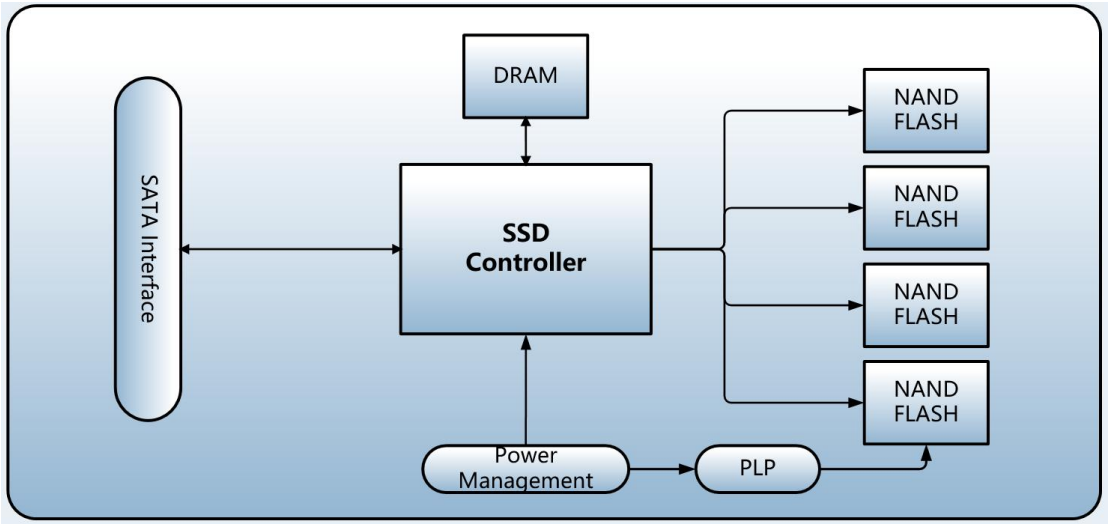
- Interface:
  SATA6.0Gbps
- Form Factor:
  2.5inch 100.2x69.85x7.0mm
- Capacity:
  2TB / 4TB / 7.68TB
- NAND FLASH:
  3D TLC
- Operating Temp.:
  0~70℃ / -20~70℃ / -40~85℃
- Storage Temp.:
  -40~85℃ (Non-Wide-Temp. Products)
  -55~95℃ (Wide-Temp. Products)
- Vibration:
  10g 10~2000Hz (Non-operating)
- Shock:
  1500G 0.5ms (Non-operating)
- Performance:
  Seq. read up to 540MB/s
  Seq. write up to 520MB/s
- Power:
  5V ±5%
  Idle≤1.5w
  Operating≤5.5w
- Connector:
  SATA 7+15pin plug
- Protocol:
  Compatible with SerialATA3.1
  Support ATA/ATAPI-8
  Support NCQ
  Support TRIM
  Support S.M.A.R.T
- Data integrity and Protection
  LDPC
  Internal data durability technology
  Static data refresh ensures data integrity
  Bad block management
  Wear leveling
  Power losing Protection
- Reliability:
  MTBF>3,000,000hours
  UBER 10^{-17}bits per sector
- TBW:
  2TB=2560TB
  4TB=5120TB
  7.68TB=10240TB

Content

1.Overview

The KINGPINS KP60 series 3D TLC 2.5" SATA6Gbps Solid State Drive (SSD) delivers leading performance in an industry standard 2.5" form factor while simultaneously improving system responsiveness for rugged computer applications over standard rotating drive media or hard disk drives. By combining leading NAND flash memory technology with innovative high-performance firmware, KINGPINS KP60 series delivers a SSD for native Serial Advanced Technology Attachment (SATA) hard disk drive drop-in replacement with enhanced performance, reliability, ruggedness and power savings. Since there are no rotating platters, moving heads, fragile actuators, or unnecessary delays due to spin-up time or positional seek time that can slow down the storage subsystem, significant I/O and throughput performance improvement is achieved as compared to rotating media or hard disk drives. The KINGPINS KP60 series support Power Losing Protection (PLP) feature.

This document describes the specifications of the KINGPINS KP60 3D TLC 2.5 "SATA6Gbps SSD in 2.5" form factors.



SSD Block Diagram

2.Specification

2.1 Interface

SATA Revision 3.1 compliant

SATA6.0Gbps，compatible with SATA3.0Gbps and SATA1.5Gbps interface

2.2 Capacity

Capacity	Formatted Capacity	LBA
2TB	1863.02GBGB	3,907,029,168
4TB	3725.90GB	7,814,037,168
7.68TB	7153.83GB	15,002,931,888

2.3 Band Performance

Capacity	Sequential Read	Sequential Write	Unit
2TB	520	480	MB/s
4TB	530	500	MB/s
7.68TB	540	520	MB/s

2.4 Electrical Characteristics

\			2TB	4TB	7.68TB
Operating Voltage		(V)	5 ±5%		
Power Consumption	Idle	(W)	1.5	1.5	1.5
	Operating	(W)	4.0	5.0	5.5

2.5 Environment

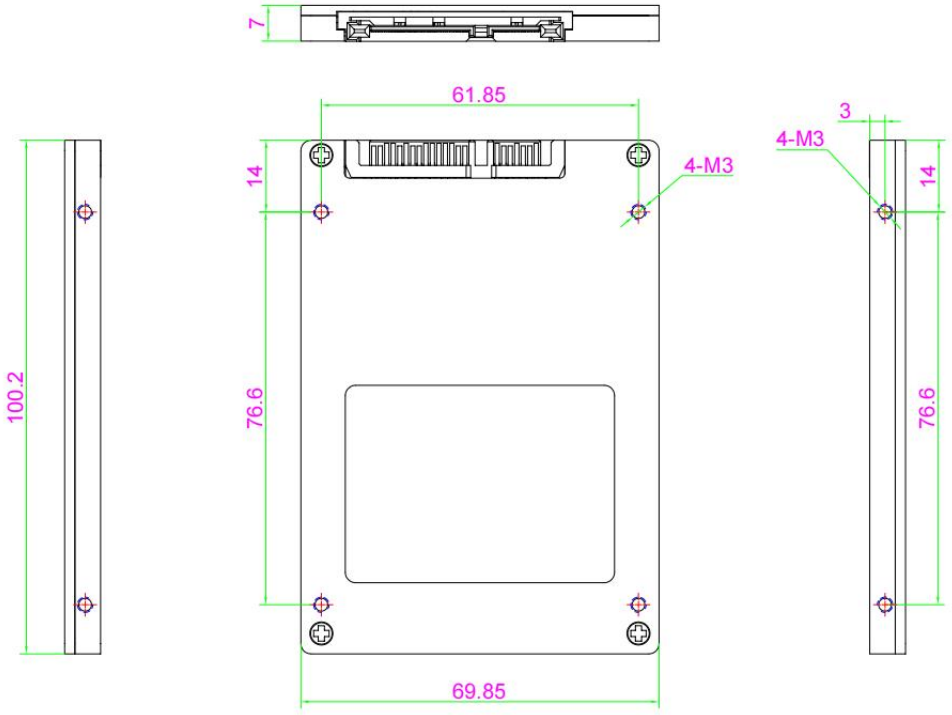
Parameter	Value
Operating Temperature	0 ~ 70℃ -20 ~ 70℃ -40 ~ 85℃
Storage Temperature	-40~85℃

	(Non-Wide-Temp. Products) -55~95℃ (Wide-Temp. Products)
Relative Humidity	5 ~ 95% (Non-condensing, with Conformal Coating)
Operating Vibration	10g 10~2000Hz (Non-operating)
Operating Shock	1500G 0.5ms (Non-operating)

3.Mechanical

Dimension	Value	Tolerance	Unit
Length	100.2	±0.25	mm
Width	69.85	±0.25	mm
Height	7	±0.25	mm

Mechanical Drawing



4.Pin Locations and Signal Descriptions

4.1 Signal Pin Description

Pin	Type	Description
S1	GND	Ground
S2	RxP	Differential signal pair A
S3	RxN	
S4	GND	Ground
S5	TxN	Differential signal pair B
S6	TxP	
S7	GND	Ground
P1	$V_{3.3}$	Not Use
P2	$V_{3.3}$	Not Use
P3	$V_{3.3}$	Not Use
P4	GND	Ground 5V
P5	GND	Ground 5V
P6	GND	Ground 5V
P7	V_5	5V Power
P8	V_5	5V Power
P9	V_5	5V Power
P10	GND	Ground 5V
P11	DAS/DSS	Not Use(Option)
P12	GND	Ground 5V
P13	V_{12}	Not Use
P14	V_{12}	Not Use
P15	V_{12}	Not Use

5.Reliability

5.1 Reliability

Item	Value
ECC	LDPC
UBER	<1 sector per 10^{-17} bits read
MTBF Mean time between failures is estimated based on Telcordia SR-332 standard methodology.	3,000,000 hours

5.2 Endurance

TBW (Total Bytes Written)

Capacity	TBW Value
2TB	2560TB
4TB	5120TB
7.68TB	10240TB

5.3 Temperature Sensor

KINGPINS KP60 series has an internal temperature sensor which can be monitored using a SMART attribute。

5.4 Hot Plug Support

Hot Plug insertion and removal are supported when the correct connector and an appropriate operating system (OS) are used as described in the SATA 3.0 Specification. This product supports asynchronous signal recovery and will establish communications with a host system without hardware device detection by issuing an unsolicited COMINIT when first mated with a powered connector.

5.5 Power Losing Protection (PLP)

KINGPINS KP60 series has tantalum capacitor on board to Protection data when unexpected power off.

5.6 High-Temperature Throttling

The SSDs in this series are equipped with an onboard temperature sensor that is accessible through S.M.A.R.T. monitoring. The high-temperature throttling mechanism guarantees reliable operation and data integrity in elevated temperature conditions. To ensure normal operation under high temperatures, the chip temperature must not exceed 85°C for non-wide-temperature SSDs and 100°C for wide-temperature SSDs.

6.Support Command Sets

Code	Command Name	Code	Command Name
00h	NOP	B0h	SMART
06h	Data Set Management	C4h	Read Multiple
20h	Read Sectors	C5h	Write Multiple
24h	Read Sectors EXT	C6h	Set Multiple Mode
25h	Read DMA EXT	C8h	Read DMA
27h	Read Native Max Address EXT	CAh	Write DMA
29h	Read Multiple EXT	E0h	Standby Immediate
2Fh	Read Log EXT	E1h	Idle Immediate
30h	Write Sectors	E2h	Standby
34h	Write Sectors EXT	E3h	Idle
35h	Write DMA EXT	E4h	Read Buffer
37h	Set Max Address EXT	E5h	Check Power Mode
39h	Write Multiple EXT	E6h	Sleep
40h	Read Verify Sectors	E7h	Flush Cache
42h	Read Verify Sectors EXT	E8h	Write Buffer
60h	Read FPDMA Queued	Eah	Flush Cache EXT
61h	Write FPDMA Queued	Ech	Identify Device
70h-7Fh	Seek	Efh	Set Features
90h	Execute Device Diagnostic	F1h	Security Set Password
91h	Initialize Device Parameters	F2h	Security Unlock
94h	STANDBY IMMEDIATE	F3h	Security Erase Prepare
95h	IDLE IMMEDIATE	F4h	Security Erase Unit
96h	STANDBY	F5h	Security Freeze Lock
97h	IDLE	F6h	Security Disable Password
98h	CHECK POWER MODE	F8h	Read Native Max Address
99h	SLEEP	F9h	Set Max Address

SMART Feature Set

Code	Command	Code	Command
D0h	Read Data	D5h	Read Log
D1h	Read Attribute Threshold	D6h	Write Log
D2h	Enable/Disable Autosave	D8h	Enable SMART Operations
D3h	Save Attribute Value	D9h	Disable SMART Operations
D4h	Execute OFF-LINE Immediate	Dah	Return Status

SMART Attributes

Attribute ID(hex)	Attribute Name
01	Read error rate
05	Reallocated sectors count
09	Power-on hours
0C	Power cycle count
A0	Uncorrectable sector count when read/write
A1	Number of valid spare block
A3	Number of initial invalid block
A4	Total erase count
A5	Maximum erase count
A6	Minimum erase count
A7	Average erase count
A8	Max erase count of spec
A9	Remain life (percentage)
AF	Program fail count in worst die
B0	Erase fail count in worst die
B1	Total wearlevel count
B2	Runtime invalid block count
B5	Total program fail count

B6	Total erase fail count
BB	Uncorrectable error count
C0	Power-off retract count
C2	Controlled temperature
C3	Hardware ECC recovered
C4	Reallocation event count
C6	Uncorrectable error count off-line
C7	UltraDMA CRC error count
E1	Total LBAs written (each write unit=32MB)
E8	Available reserved space
F1	Total LBAs written (each write unit=32MB)
F2	Total LBAs read (each read unit=32MB)

7.Ordering

Product Description	Model Number
SATA6.0Gbps 2.5 3D TLC 2TB 0~70℃ PLP	KP60-S25L002TTCP
SATA6.0Gbps 2.5 3D TLC 4TB 0~70℃ PLP	KP60-S25L004TTCP
SATA6.0Gbps 2.5 3D TLC 7.68TB 0~70℃ PLP	KP60-S25L008TTCP
SATA6.0Gbps 2.5 3D TLC 2TB -20~70℃ PLP	KP60-S25L002TTEP
SATA6.0Gbps 2.5 3D TLC 4TB -20~70℃ PLP	KP60-S25L004TTEP
SATA6.0Gbps 2.5 3D TLC 7.68TB -20~70℃ PLP	KP60-S25L008TTEP
SATA6.0Gbps 2.5 3D TLC 2TB -40~85℃ PLP	KP60-S25L002TTWP
SATA6.0Gbps 2.5 3D TLC 4TB -40~85℃ PLP	KP60-S25L004TTWP
SATA6.0Gbps 2.5 3D TLC 7.68TB -40~85℃ PLP	KP60-S25L008TTWP