INFINITES® SOLID-STATE DRIVE

SATA6.0Gbps mSATA SLC

KP46 Series

Product Specification

KINGPINS TECH CO.,LIMITED

Revision

Revision	Date	Description
00	May. 2025	Initial Release

Feature

- Interface:
  SATA6.0Gbps
- Form Factor:
  mSATA（MO300）50.8x29.85x3.7mm
- Capacity:
  2GB / 4GB / 8GB / 16GB
- NAND FLASH:
  SLC
- 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 100MB/s
  Seq. write up to 80MB/s
- Power:
  3.3V ±5%
  Idle≤0.4w
  Operating≤1.2w
- Connector:
  miniPCIe 52Pin Golden Finger
- Protocol:
  Compatible with SerialATA3.1
  Support ATA/ATAPI-8 and ACS-2
  Support NCQ
  Support S.M.A.R.T
- Data integrity and Protection
  BCH ECC 60-bit/1KB
  Internal data durability technology
  Static data refresh ensures data integrity
  Bad block management
  Wear leveling
- Reliability:
  MTBF>2,000,000hours
  UBER 10^{-15}bits per sector
- TBW:
  2GB=25TB
  4GB=50TB
  8GB=100TB
  16GB=200TB

Content

1.Overview 5

2.Specification 6

2.1 Interface 6

2.2 Capacity 6

2.3 Band Performance 6

2.4 Electrical Characteristics 6

2.5 Environment 6

3.Mechanical 8

4.Pin Locations and Signal Descriptions 9

4.1 Signal Pin Description 9

5.Reliability 10

5.1 Reliability 10

5.2 Endurance 10

5.3 Bad block management 10

5.4 Wear Leveling 10

5.5 Garbage collection 10

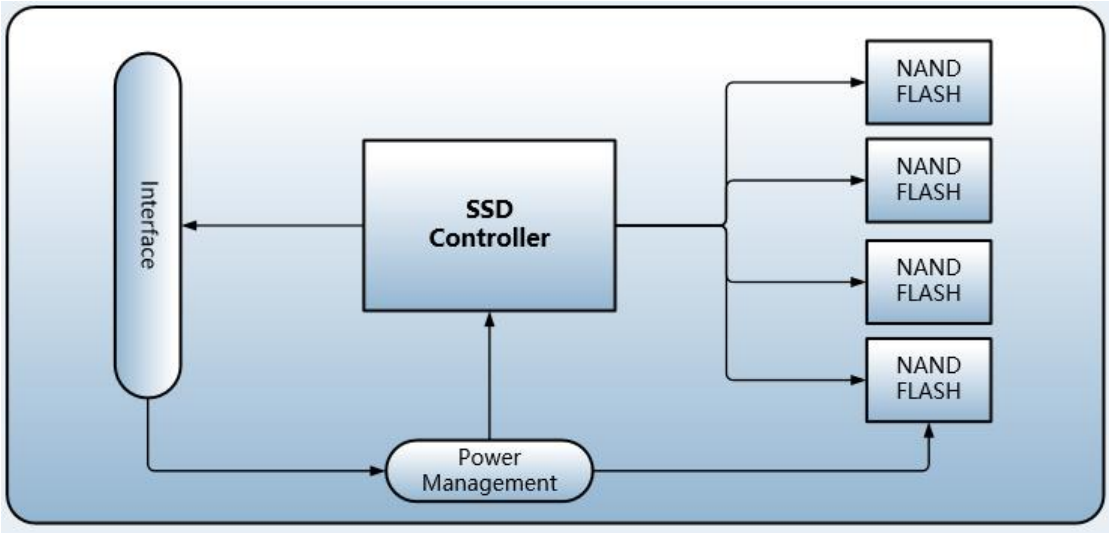
6.Support Command Sets 11

7.Ordering 13

1.Overview

The KINGPINS KP46 series SLC mSATA SATA6Gbps Solid State Drive (SSD) delivers leading performance in an industry standard mSATA 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 KP46 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.

This document describes the specifications of the KINGPINS KP46 SL C SATA6Gbps SSD in mSATA 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
2GB	1.86GB	3,900,702
4GB	3.72GB	7,837,200
8GB	7.45GB	15,623,782
16GB	14.9GB	31,247,564

2.3 Band Performance

Capacity	Sequential Read	Sequential Write	Unit
2GB	56	42	MB/s
4GB	60	46	MB/s
8GB	60	48	MB/s
16GB	100	80	MB/s

2.4 Electrical Characteristics

\			2GB	4GB	8GB	16GB
Operating Voltage		(V)	3.3 ±5%			
Power Consumption	Idle	(W)	0.4	0.4	0.4	0.4
	Operating	(W)	0.6	0.8	1.0	1.2

2.5 Environment

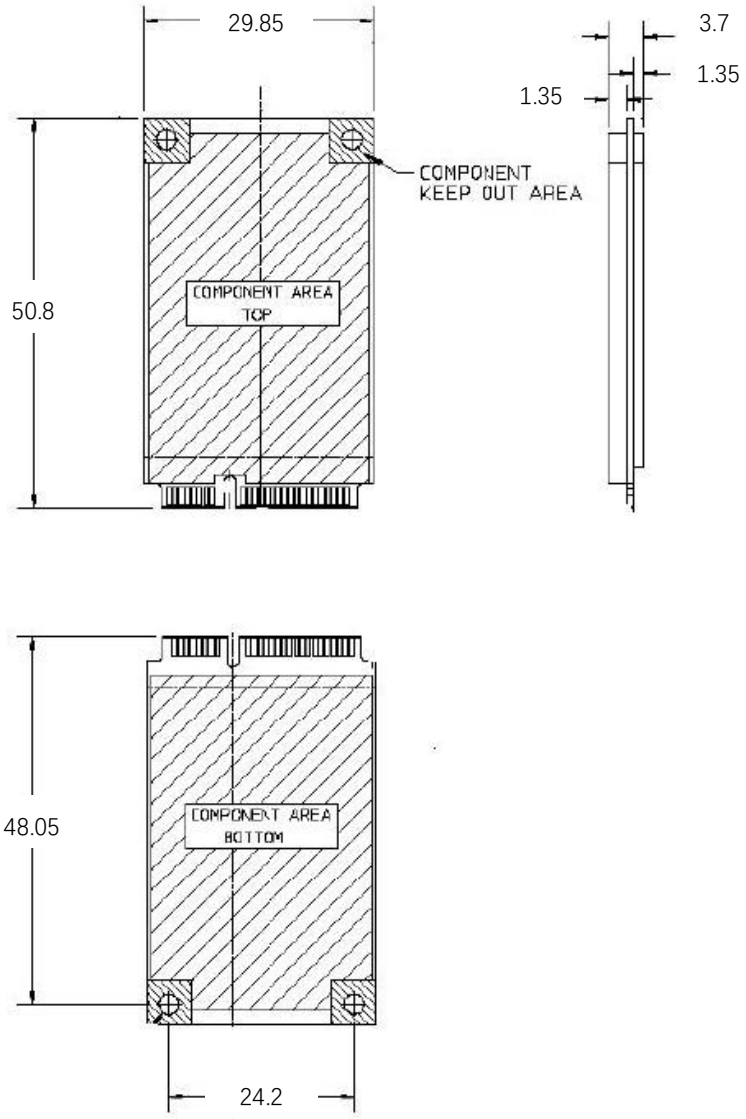
Parameter	Value
Operating Temperature	0 ~ 70℃

	-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	50.8	±0.2	mm
Width	29.85	±0.2	mm
Height	3.7	±0.2	mm

Mechanical Drawing



4.Pin Locations and Signal Descriptions

4.1 Signal Pin Description

Pin	Type	Description	Pin	Type	Description
1	Reserved	Not Use	27	GND	Ground
2	+3.3V	3.3V Power	28	N/A	Not Use
3	N/A	Not Use	29	GND	Ground
4	GND	Ground	30	N/A	Not Use
5	N/A	Not Use	31	-A	Differential signal pair RX-
6	N/A	Not Use	32	N/A	Not Use
7	N/A	Not Use	33	+A	Differential signal pair RX+
8	N/A	Not Use	34	GND	Ground
9	GND	Ground	35	GND	Ground
10	N/A	Not Use	36	N/A	Not Use
11	N/A	Not Use	37	GND	Ground
12	N/A	Not Use	38	N/A	Not Use
13	N/A	Not Use	39	+3.3V	3.3V Power
14	N/A	Not Use	40	GND	Ground
15	GND	Ground	41	+3.3V	3.3V Power
16	N/A	Not Use	42	N/A	Not Use
17	N/A	Not Use	43	GND	Ground(Option)
18	GND	Ground	44	N/A	Not Use
19	N/A	Not Use	45	N/A	Not Use
20	N/A	Not Use	46	N/A	Not Use
21	GND	Ground	47	N/A	Not Use
22	N/A	Not Use	48	N/A	Not Use
23	+B	Differential signal pair TX+	49	N/A	Not Use(Option)
24	+3.3V	3.3V Power	50	GND	Ground
25	-B	Differential signal pair TX-	51	GND	Ground
26	GND	Ground	52	+3.3V	3.3V Power

5.Reliability

5.1 Reliability

Item	Value
BCH ECC	60-bit/1KB
UBER	<1 sector per 10^{-15} bits read
MTBF Mean time between failures is estimated based on Telcordia SR-332 standard methodology.	2,000,000 hours

5.2 Endurance

TBW (Total Bytes Written)

Capacity	TBW Value
2GB	25TB
4GB	50TB
8GB	100TB
16GB	200TB

5.3 Bad block management

The Bad Block Management algorithm automatically detects and marks the internal "blocks" of the flash memory. It identifies unusable "blocks" as bad blocks and replaces them with new reserve "blocks" to ensure the proper operation of the solid-state drive.

5.4 Wear Leveling

The Static and Dynamic Wear-Leveling algorithms are used to balance the wear level across all "blocks" in the solid-state drive. This enables the drive to maximize its usable lifespan within the limited number of erase cycles for each "block".

5.5 Garbage collection

The Active and Passive Garbage Collection algorithms are designed to reduce the frequency of invalid erasures on the flash memory "blocks" of the solid-state drive, thereby indirectly extending the erasable lifespan of the "blocks".

6.Support Command Sets

Value	Command	Value	Command
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 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 mSATA SLC 2GB 0~70℃	KP46-MSAL002GSC0
SATA6.0Gbps mSATA SLC 4GB 0~70℃	KP46-MSAL004GSC0
SATA6.0Gbps mSATA SLC 8GB 0~70℃	KP46-MSAL008GSC0
SATA6.0Gbps mSATA SLC 16GB 0~70℃	KP46-MSAL016GSC0
SATA6.0Gbps mSATA SLC 2GB -20~70℃	KP46-MSAL002GSE0
SATA6.0Gbps mSATA SLC 4GB -20~70℃	KP46-MSAL004GSE0
SATA6.0Gbps mSATA SLC 8GB -20~70℃	KP46-MSAL008GSE0
SATA6.0Gbps mSATA SLC 16GB -20~70℃	KP46-MSAL016GSE0
SATA6.0Gbps mSATA SLC 2GB -40~85℃	KP46-MSAL002GSW0
SATA6.0Gbps mSATA SLC 4GB -40~85℃	KP46-MSAL004GSW0
SATA6.0Gbps mSATA SLC 8GB -40~85℃	KP46-MSAL008GSW0
SATA6.0Gbps mSATA SLC 16GB -40~85℃	KP46-MSAL016GSW0