Kingston Technology
SSD*Now* V+100E (Full Disk Encryption)
Flash Storage Drive

This product description of the SSD*Now* Solid State flash drive is provided by Kingston, and is applicable for all Kingston's V+100E series SSDNow products based on flash.

Interface: SATA 1.5Gb/s and 3.0Gb/s

Form factor: 2.5" Form Factor

Certifications

· **FCC**

· **C-Tick**

· **BSMI**

· **VCCI**

· **CE**

SVP100ES2/64G	**Seq. Read: 230 MB/s - Seq. Write: 180 MB/s**
SVP100ES2/128G	**Seq. Read: 230 MB/s - Seq. Write: 180 MB/s**
SVP100ES2/256G	**Seq. Read: 230 MB/s - Seq. Write: 180 MB/s**

Full-Disk Encryption

- 128-bit AES Hardware-based Encryption – 100% Full-Disk Encryption
- Counter Mode Encryption (CTR)
- Supports ATA Secure Erase
  - ATA Secure Erase will fully destroy the data on the SSD. Data, Hidden, Wear Leveling blocks are wiped
- Supports ATA Enhanced Secure Erase
  - ATA Enhanced Secure Erase destroys the Key used to encrypt
- Utilizes ATA Security Command
  - BIOS initiated password authentication
    - Master-level
    - User-level
- No performance loss compared to software-based encryption
- Client based security

Functional Block Diagram
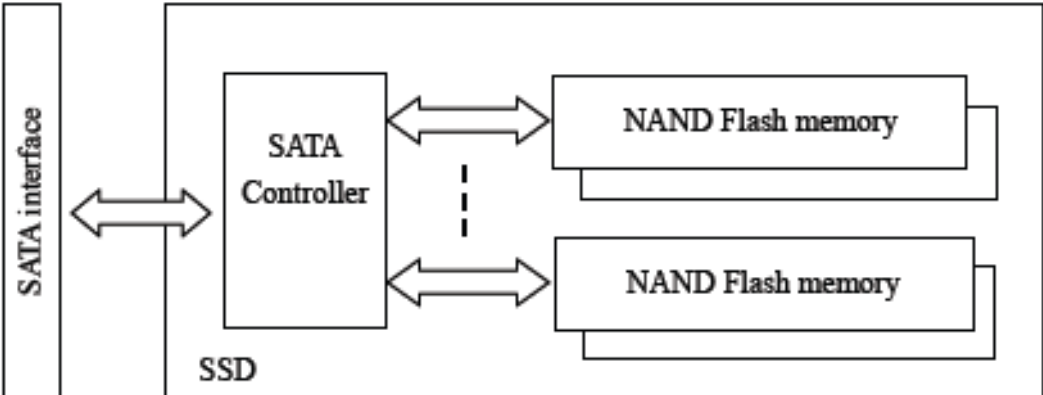
Kingston SSDNow V+ series Block Diagram

Pin Assignment

	Name	Type	Description
Signal Segment	S1	GND	
	S2	A+	Differential Signal Pair A
	S3	A-	
	S4	GND	
	S5	B-	Differential Signal Pair B
	S6	B+	
	S7	GND	
Key and Spacing separate signal and power segments			
Power Segment	P1	V33	3.3V Power (Unused)
	P2	V33	3.3V Power (Unused)
	P3	V33	3.3V Power, Pre-charge (Unused)
	P4	GND	
	P5	GND	
	P6	GND	
	P7	V5	5V Power, Pre-charge
	P8	V5	5V Power
	P9	V5	5V Power
	P10	GND	
	P11	DAS/DSS	Device Activity Signal / Disable Staggered Spinup
	P12	GND	
	P13	V12	12V Power, Pre-charge
	P14	V12	12V Power
	P15	V12	12V Power

DC Specification

Recommended Operating Conditions:

Parameter	Symbol	Min	Typ	Max	Unit	Note
Operating Temperature	T_a	0	25	70	°C	
VCC Voltage	V_{cc}	4.75	5	5.25	V	

Power Consumption:

256GB

Parameter	Typ	Max	Unit
Active	3.3	5.8	W
Idle	52		mW

128GB

Parameter	Typ	Max	Unit
Active	3.0	5.2	W
Idle	52		mW

64GB

Parameter	Typ	Max	Unit
Active	2.8	5.2	W
Idle	51		mW

Environmental Specifications

• Operating temperature: 0°C ~ 70°C

• Storage temperature: -40° ~ 85°C

• Storage humidity: 95% (max)

• Vibration Operating: 2.17G (7-800Hz)

• Vibration Non-Operation: 20G (20-2000Hz)

• Shock: 1500G Acceleration force (0.5ms - Half-sine waveform)

• MTBF: 1,000,000 Hrs

Command Description

The drive interprets the commands written in the Command register by the host system and executes them. This table shows the drive's response to the valid commands written in Command register.

Each commands description is reference to the original ATA specifications.

	x0h	x1h	X2h	X3h	X4h	X5h	X6h	X7h	X8h	X9h	xAh	xBh	xCh	xDh	xEh	xFh
0xh	√						√									
1xh	√															
2xh	√	√			√	√		√		√						√
3xh	√	√			√	√		√		√				√		√
4xh	√	√	√			√		√								
5xh								√								
6xh	(√)	(√)														
7xh	√															
8xh																
9xh	√	√	√													
Axh																
Bxh	√	√														
Cxh					√	√	√		√	√	√	√			√	
Dxh																
Exh	√	√	√	√	√	√	√	√	√		√		√			√
Fxh		√	√	√	√	√	√		√	√						

Command Listing

Op-Code	Command Description	Notes
00h	NOP	
06h	DATA SET MANAGEMENT	
10h	RECALIBRATE	No operation
20h	READ SECTOR(S)	
21h	READ SECTOR(S) without retry	With retry operation
24h	READ SECTOR(S) EXT	
25h	READ DMA EXT	
27h	READ NATIVE MAX ADDRESS EXT	
29h	READ MULTIPLE EXT	
2Fh	READ LOG EXT	
30h	WRITE SECTOR(S)	
31h	WRITE SECTOR(S) without retry	With retry operation
34h	WRITE SECTOR(S) EXT	
35h	WRITE DMA EXT	
37h	SET MAX ADDRESS EXT	
39h	WRITE MULTIPLE EXT	
3Dh	WRITE DMA FUA EXT	
3Fh	WRITE LOG EXT	
40h	READ VERIFY SECTOR(S)	
41h	READ VERIFY SECTOR(S) without retry	With retry operation
42h	READ VERIFY SECTOR(S) EXT	
45h	WRITE UNCORRECTABLE EXT	
47h	READ LOG DMA EXT	
57h	WRITE LOG DMA EXT	
60h	READ FPDMA QUEUED	If NCQ supported
61h	WRITE FPDMA QUEUED	If NCQ supported
70h	SEEK	No operation

Op-Code			Command Description	Notes
90h			EXECUTE DEVICE DIANOSTIC	
91h			INITIALIZE DEVICE PARAMETERS	
92h			DOWNLOAD MICROCODE	
BOh			SMART	
BOh	DOh		SMART READ DATA	
BOh	D1h		SMART READ ATTRIBUTE THRESHOLDS	
BOh	D2h		SMART ENABLE/DISABLE ATTRIBUTE AUTOSAVE	
BOh	D3h		SMART SAVE ATTRIBUTE VALUES	
BOh	D4h		SMART EXECUTE OFF-LINE IMMEDIATE	
BOh	D5h		SMART READ LOG	
BOh	D6h		SMART WRITE LOG	
BOh	D8h		SMART ENABLE OPERATIONS	
BOh	D9h		SMART DISABLE OPERATIONS	
BOh	DAh		SMART RETURN STATUS	
BOh	DBh		SMART ENABLE/DISABLE AUTOMATIC OFF-LINE	
B1h			DEVICE CONFIGURATION OVERLAY	
B1h	COh		DEVICE CONFIGURATION RESTORE	
B1h	C1h		DEVICE CONFIGURATION FREEZE LOCK	
B1h	C2h		DEVICE CONFIGURATION IDENTIFY	
B1h	C3h		DEVICE CONFIGURATION SET	
C4h			READ MULTIPLE	
C5H			WRITE MULTIPLE	
C6H			SET MULTIPLE MODE	
C8H			READ DMA	
C9H			READ DMA without retry	With retry operation
CAh			WRITE DMA	
CBh			WRITE DMA without retry	With retry operation
CEh			WRITE MULTIPLE FUA EXT	
EOh			STAND IMMEDIATE	
E1h			IDLE IMMEDIATE	
E2h			STANDBY	
E3h			IDLE	
E4h			READ BUFFER	
E5h			CHECK POWER MODE	
E6h			SLEEP	
E7h			FLUSH CACHE	
E8h			WRITE BUFFER	
EAh			FLUSH CACHE EXT	
ECh			IDENTIFY DEVICE	
EFh			SET FEATURES	
EFh	02h		Enable volatile write cache	
EFh	03h		Set transfer mode	
EFh	05h		Enable APM feature set	
EFh	10h		Enable Serial ATA feature set	
EFh	10h	02h	Enable DMA Auto-Active	
EFh	10h	03h	Enable DIPM transition	
EFh	10h	06h	Enable SSP	
EFh	55h		Disable read look-ahead	
EFh	66h		Disable revertina to P-On default	
EFh	82h		Disable volatile write cache	
EFh	85h		Disable APM feature set	
EFh	90h		Disable Serial ATA feature set	
EFh	90h	02h	Disable DMA Auto-Active	
EFh	90h	03h	Disable DIPM	
EFh	90h	06h	Disable SSP	
EFh	AAh		Enable read look-ahead	
EFh	CCh		Enable revertina to P-On default	

Op-Code		Command Description	Notes
F1h		SECURITY SET PASSWORD	
F2h		SECURITY UNLOCK	
F3h		SECURITY ERASE PREPARE	
F4h		SECURITY ERASE UNIT	
F5h		SECURITY FREEZE LOCK	
F6h		SECURITY DISABLE PASSWORD	
F8h		READ NATIVE MAX ADDRESS	
F9h		SET MAX ADDRESS	
F9h	01h	SET MAX SET PASSWORD	
F9h	02h	SET MAX LOCK	
F9h	03h	SET MAX UNLOCK	
F9h	04h	SET MAX FREEZE LOCK	

IDENTIFY DEVICE (ECh) command response

The IDENTIFY DEVICE command requests the drive to transfer parameter information to the host. The host may read parameter information of the sector buffer. The parameter words in the buffer are arranged as shown in the following Tables.

WORD	Description		Hex
0	General Configuration		0040H
	15 0b = ATA device		
	14 0b = Not required Format speed tolerance gap	(Obsolete ATA2)	
	13 0b = Not available Track offset option	(Obsolete ATA2)	
	12 0b = Not available Data strobe offset option	(Obsolete ATA2)	
	11 0b = No report rotational speed tolerance is > 0.5%	(Obsolete ATA2)	
	10 0b = No report disk transfer rate > 10Mbs	(Obsolete ATA2)	
	9 0b = No report disk transfer rate > 5Mbs but <=10Mbs	(Obsolete ATA2)	
	8 0b = No report disk transfer rate <= 5Mbs	(Obsolete ATA2)	
	7 0b = Non removable media device	(Obsolete ATA2)	
	6 1b = Fixed device	(Obsolete ATA2)	
	5 0b = No implemented Spindle motor control option	(Obsolete ATA2)	
	4 0b = No report head switch time > 15 µs	(Obsolete ATA2)	
	3 0b = MFM encoded	(Obsolete ATA2)	
	2 0b = Not soft sectored	(Obsolete ATA2)	
	1 0b = Not hard sectored	(Obsolete ATA2)	
	0 Reserved		
1	Number of default logical cylinders	(Obsolete ATA6)	3FFFh
2	Specific configuration		C837h
3	Number of default logical heads	(Obsolete ATA6)	0010h
4	Number of unformatted bytes per track	(Obsolete ATA2)	0000h
5	Number of unformatted bytes per sector	(Obsolete ATA2)	0000h
6	Number of logical sectors per logical track	(Obsolete ATA6)	003Fh
7-8	Reserved for assignment by the CompactFlash™ Association		0000h
9	Vendor Specific	(Retired ATA4)	0000h
10-19	Serial Number	(20 ASCII characters)	ASCII
20	Buffer type	(Obsolete ATA2)	0000h
21	Buffer size in 512 byte increments	(Obsolete ATA2)	0000h
22	Number of vendor specific bytes available on READ/WRITE LONG commands	(Obsolete ATA4)	0000h
23-26	Firmware Revision	(8 ASCII characters)	ASCII
27-46	Controller model Number	(40 ASCII characters)	ASCII
47	READ/WRITE MULTIPLE commands function		8010h
	15-8 80h		
	7-0 Maximum number of sectors transfer capability		
48	Trusted Computing feature set options		0000h
	15-14 00b = Not supported this word signature		
	13-1 Reserved for the Trusted Computing Group		
	0 0b = Not supported Trusted Computing feature set		
49	Capabilities		2F00h
	15-14 Reserved for Packet device		
	13 1b = Standby timer values as specific in ATA spec.		
	12 Reserved for Packet device		
	11 1b = IORDY supported		
	10 1b = IORDY can be disable		
	9 1b = LBA supported		
	8 1b = DMA supported		
	7-2 Reserved		
	1-0 Current Long Physical Sector Alignment setting		
50	Capabilities		4000h
	15-14 01b = Support this word Signature		
	13-2 Reserved		
	1 Obsolete on ATA6		
	0 0b = Not specified Standby timer value minimum		

![Kingston Technology logo]

WORD	Description		Hex
51	PIO Data Transfer Cycle Timing	*(Obsolete AT5)*	0000h
52	DMA Data Transfer Cycle Timing	*(Obsolete ATA3)*	0000h
53	15-8 00h = Vendor recommended Free-fall Control 7-3 Reserved 2 1b = Identify word 88 is valid 1 1b = Identify words 64-70 are valid 0 1b = Identify words 54-58 are valid *(Obsolete ATA6)*		0007h
54	Number of current cylinders	*(Obsolete ATA6)*	3FFFh
55	Number of current heads	*(Obsolete ATA6)*	0010h
56	Number of current sectors per track	*(Obsolete ATA6)*	003Fh
57-58	Current capacity in sectors *(Obsolete ATA6)* (Number of current cylinders*Number of current heads*Number of current sectors per track		[*1]
59	READ/WRITE MULTIPLE commands function 15 0b = Not support BLOCK ERASE EXT command 14 0b = Not support OVERWRITE EXT command 13 0b = Not support CRYPTO SCRAMBLE EXT command 12 0b = Not support Sanitize feature set 11-9 Reserved 8 1b = Multiple sector setting is valid 7-0 xxh = Current setting for number of sectors unit		0110h (default)
60-61	Maximum number of sector (28bit LBA mode)		[*2]
62	Singleword DMA Transfer Modes	*(Obsolete ATA3)*	0000h
63	Multiword DMA Transfer Modes 15-11 Reserved 10 1b = Multiword DMA mode 2 is selected 9 0b = Multiword DMA mode 1 is not selected 8 0b = Multiword DMA mode 0 is not selected 7-3 Reserved 2 1b = Multiword DMA mode 2 and below are supported 1 1b = Multiword DMA mode 1 and 0 are supported 0 1b = Multiword DMA mode 0 is supported		0407h (default)
64	Advanced PIO Transfer Modes 15-8 Reserved for future use 7-2 Reserved 1 1b = PIO mode 4 supported 0 1b = PIO mode 3 supported		0003h
65	Minimum Multiword DMA Transfer Cycle Time per Word (ns)		0078h
66	Manufacture's recommended Multiword DMA Transfer Cycle Time (ns)		0078h
67	Minimum PIO Transfer Cycle Time without Flow Control (ns)		0078h
68	Minimum PIO Transfer Cycle Time with IORDY Flow Control (ns)		0078h
69	Additional Supported 15 0b = Not supported CFast Specification 14 0b = Not supported deterministic read after TRIM 13 0b = Not support Long Physical Sector Alignment Error Reporting Control 12 0b = Not support DEVICE CONFIGURATION IDENTIFY/SET DMA commands 11 0b = Not support for READ BUFFER DMA command 10 0b = Not support for WRITE BUFFER DMA command 9 0b = Not support SET MAX PASSWORD/UNLOCK DMA command 8 0b = Not support DOWNLOAD MICROCODE DMA command 7 0b = Reserved for IEEE-1667 6 0b = 28-bit command supported 5 0b = Reserved for Read zero after Trim 4-0 Reserved		0000h
70	Reserved		0000h
71-74	Reserved for packet device		0000h
75	Queue depth 15-5 Reserved 4-0 Maximum queue depth - 1		0000h (001Fh)

WORD	Description	Hex
76	Serial ATA features supported	0606h
	15 0b = Reserved for READ LOG DMA EXT as equivalent to READ LOG EXT	(/0706h)
	14 0b = Reserved for Device Automatic Partial to Slumber transitions	
	13 0b = Reserved for Host Automatic Partial to Slumber transitions	
	12 0b = Not support Native Command Queuing priority information	
	11 0b = Not support Unload while NCQ commands outstanding	
	10 1b = Supports Phy event counters	
	9 1b = Supports receipt of host-initiated interface power management request	
	8 0b = Not support NCQ feature set, 1b = Supported (Optional)	
	7-4 Reserved for future Serial ATA signaling speed grades	
	3 0b = Reserved for Serial ATA Gen-3 signaling speed	
	2 1b = Supports Serial ATA Gen-2 signaling speed	
	1 1b = Supported Serial ATA Gen-1 signaling speed	
	0 Shall be cleared to zero	
77	Serial ATA Additional capability	0004h/
	15-6 Reserved	0002h
	5 0b = Not supports NCQ Queue Management Command	
	4 0b = Not supports NCQ Streaming	
	3-1 Current Negotiation Speed	
	0 Shall be cleared to zero	
78	Serial ATA features supported	004Ch
	15-7 Reserved	
	6 1b = Supports software setting preservation	
	5 Reserved	
	4 0b = Not support in-order data delivery	
	3 1b = Supports initializing interface power management	
	2 1b = Supports DMA Setup Auto Active Optimization	
	1 0b = Not support non-zero buffer offsets in DMA Setup FIS	
	0 Shall be cleared to zero	
79	Serial ATA features enabled	0040
	15-8 Reserved	(default)
	7 0b = Reserved for Device Automatic Partial to Slumber transitions	
	6 1b = Software setting preservation enabled	
	5 Reserved	
	4 0b = In order data delivery disabled	
	3 0b =	
	2 0b =	
	1 0b = Non-zero buffer offsets in DMA Setup FIS disabled	
	0 Shall be cleared to zero	
80	Major version number	01F8h
	15-9 Reserved	
	8 1b = Supports ATA8-ACS	
	7 1b = Supports ATA/ATAPI-7	
	6 1b = Supports ATAATAPI-6	
	5 1b = Supports ATA/ATAPI-5	
	4 1b = Supports ATA/ATAPI-4	
	3 1b = Supports ATA-3 *(Obsolete ATA7)*	
	2 0b = Not support ATA-2 *(Obsolete ATA6)*	
	1 0b = Not support ATA-1 *(Obsolete ATA5)*	
	0 Reserved	
81	Minor version number	0000h
	0000h Device does not report this version	
82	Command set supported	746Bh
	15 *Obsolete on ATA4*	
	14 1b = NOP command supported	
	13 1b = READ BUFFER command supported	
	12 1b = WRITE BUFFER command supported	
	11 *Obsolete on ATA4*	
	10 1b = Host Protected Area feature set supported	
	9 0b = Not supported DEVICE RESET command	
	8 0b = Not supported SERVICE interrupt *(Obsolete ATA8)*	
	7 0b = Not support Release interrupt *(Obsolete ATA8)*	
	6 1b = Look-ahead supported	
	5 1b = Write cache supported	
	4 0b = Not support PACKET command feature set	

WORD	Description	Hex
	3 1b = Power management feature set supported	
	2 0b = Not support removable feature set *(Obsolete ATA8)*	
	1 1b = Security feature set supported	
	0 1b = SMART feature set supported	
83	Command set supported	7D09h
	15-14 01b = Support this word signature	
	13 1b = FLUSH CACHE EXT command supported	
	12 1b = FLUSH CACHE command supported	
	11 1b = Device Configuration Overlay supported	
	10 1b = 48-bit Address feature set supported	
	9 0b = Not support Automatic Acoustic Management feature	
	8 1b = Set MAX security extension supported	
	7 Reserved for the Address Offset Reserved Area Boot Method	
	6 0b = No SET FEATURES subcommand require to spin up after power-up	
	5 0b = Not support Power-up in Standby feature	
	4 0b = Not support Removable Media Status Notification feature *(Obsolete ATA8)*	
	3 1b = Advanced Power Management feature set supported	
	2 0b = CFA feature set not supported	
	1 0b = TCQ features set not support	
	0 1b = DOWNLOAD MICROCODE command supported	
84	Command set/feature supported extension	4163h
	15-14 01b = Support this word signature	4063h
	13 0b = Not support IDLE IMMEDIATE with UNLOAD feature	
	12-11 Reserved for TLC	
	10 0b = Not support URG bit for WRITE STREAM commands *(Obsolete ATA8)*	
	9 0b = Not support URG bit for READ STREAM commands *(Obsolete ATA8)*	
	8 1b = 64bit World wide name supported, 0b = Not supported	
	7 0b = Not support WRITE DMA QUEUED FUA EXT command	
	6 1b = WRITE DMA FUA EXT and WRITE MULTIPLE FUA EXT commands supported	
	5 1b = General Purpose Logging feature set supported	
	4 0b = Not supported Streaming feature set	
	3 0b = Not support Media Card Pass Through Command feature set	
	2 0b = Not support Media serial number	
	1 1b = SMART Self-Test supported	
	0 1b = SMART error logging supported	
85	Command set/feature enabled	7469h
	15 *Obsolete on ATA4*	(default)
	14 1b = NOP command enabled	
	13 1b = READ BUFFER command enabled	
	12 1b = WRITE BUFFER command enabled	
	11 *Obsolete on ATA4*	
	10 1b = Host Protected Area feature set enabled	
	9 0b = DEVICE RESET command disabled	
	8 0b = SERVICE interrupt	
	7 0b = Release interrupt disabled	
	6 1b = Look-ahead enabled	
	5 1b = Write cache enabled	
	4 0b = PACKET command feature set not support	
	3 1b = Power management feature set enabled	
	2 0b = Removable feature set disabled	
	1 0b = Security feature set disabled	
	0 1b = SMART feature set enabled	
86	Command set/feature enabled	BC09h
	15 1b = Words 119~120 are valid	(default)
	14 Reserved	
	13 1b = FLUSH CACHE EXT command supported	

WORD	Description	Hex
	12 1b = FLUSH CACHE command supported 11 1b = Device Configuration Overlay supported 10 1b = 48bit Address feature set supported 9 0b = Not support Automatic Acoustic Management feature 8 0b = Set MAX security extension disabled, 1b = Enabled 7 Reserved for Address Offset Reserved Area Boot Method 6 0b = SET FEATURES subcommand not required to spin up after power-up 5 0b = Not support Power-Up in Standby feature 4 0b = Not support Removable Media Status Notification feature *(Obsolete ATA8)* 3 1b = Advanced Power Management feature set enabled 2 0b = Not support CFA feature 1 0b = Not support TCQ feature 0 1b = DOWNLOAD MICROCODE command supported	
87	Command set/feature default	4163h/ 4063h
	15-14 01b = Support this word signature 13 0b = Not Support IDLE IMMEDIATE with UNLOAD feature 12-11 Reserved for TLC 10 0b = Not supported URG bit for WRITE STREAM commands *(Obsolete ATA8)* 9 0b = Not supported URG bit for READ STREAM commands *(Obsolete ATA8)* 8 1b = 64bit World wide name supported, 0b = Not supported 7 0b = Not support WRITE DMA QUEUED FUA EXT command 6 1b = WRITE DMA/MULTIPLE FUA EXE commands supported 5 1b = General Purpose Logging feature set supported 4 0b = Valid CONFIGURE STREAM command not execute *(Obsolete ATA8)* 3 0b = Not support Media Card Pass Through Command feature 2 0b = Media serial number is invalid 1 1b = SMART Self-Test supported 0 1b = SMART error logging supported	
88	Ultra DMA Transfer Mode	003Fh (default)
	15 Reserved 14 0b = Ultra DMA mode 6 is not selected 13 0b = Ultra DMA mode 5 is not selected, 1b = selected 12 0b = Ultra DMA mode 4 is not selected, 1b = selected 11 0b = Ultra DMA mode 3 is not selected, 1b = selected 10 0b = Ultra DMA mode 2 is not selected, 1b = selected 9 0b = Ultra DMA mode 1 is not selected, 1b = selected 8 0b = Ultra DMA mode 0 is not selected, 1b = selected 7 Reserved 6 1b = Ultra DMA mode 6 and below are supported 5 1b = Ultra DMA mode 5 and below are supported 4 1b = Ultra DMA mode 4 and below are supported 3 1b = Ultra DMA mode 3 and below are supported 2 1b = Ultra DMA mode 2 and below are supported 1 1b = Ultra DMA mode 1 and 0 are supported 0 1b = Ultra DMA mode 0 is supported	
89	Time required for Normal Security erase completion	0001h/ 0002h
	15-8 Reserved 7-0 Required SECURITY ERASE UNIT command execution time	
90	Time required for Enhanced Security erase completion	0001h
	15-8 Reserved 7-0 Required SECURITY ERASE UNIT command execution time	
91	Current Advanced Power Management setting	0080h (default)
	15-8 Reserved 7-0 Current APM setting set by SET FEATURED command	
92	Master Password Identifier	FFFEh
93	Reserved for Hardware Reset result of Parallel ATA device	0000h
94	Current automatic acoustic management value	0000h
95	Stream Minimum Request Size	0000h
96	Streaming Transfer Time - DMA	0000h
97	Streaming Access Latency - DMA and PIO	0000h

WORD	Description	Hex
98-99	Streaming Performance Granularity	0000h
100-103	Maximum user LBA for 48-bit Address feature set	[*3]
104	Streaming Transfer Time - PIO	0000h
105	Reserved for Maximum number of DATA SET MANAGEMENT command Entries	0000h
106	Physical sector size/Logical sector size	4000h
	15-14 01b = Support this word signature 13 0b = Device does not have multiple logical sectors per physical sector 12 0b = Device logical sector size is 256 words 11-4 Reserved 3-0 2* logical sectors per physical sector	
107	Inter-seek delay for ISO7779 standard acoustic testing	0000h
108-111	World wide name	(0000h)
112-115	Reserved for world wide name extension to 128 bits	0000h
116	Reserved for TLC	0000h
117-118	Logical sector size [When Word 106 bit 12 = 1b]	00000000h
119	Commands and feature sets supported	401Ch
	15-14 01b = Support this word signature 13-8 Reserved 7 0b = Reserved for Extended Power Conditions feature 6 0b = Not support Extended Status Reporting feature 5 0b = Not support Free fall Control feature 4 1b = DOWNLOAD MICROCODE command with mode 3 is supported 3 1b = READ/WRITE LOG DMA EXT commands are supported 2 1b = WRITE UNCORRECTABLE EXT is supported 1 0b = Not support Write-Read-Verify feature 0 0b = Reserved for DDT	
120	Command and feature set supported or enabled	401Ch
	15-14 01b = Support this word signature 13-8 Reserved 7 Reserved for Extended Power Condition idle timer 6 Not support Extended Status Reporting feature 5 Not support Free fall Control feature 4 DOWNLOAD MICROCODE command with mode 3 is supported 3 READ/WRITE LOG DMA EXT commands are supported 2 WRITE UNCORRECTABLE EXT is supported 1 Not support Write-Read-Verify feature 0 Reserved for DDT	
121-126	Reserved for expanded supported and enabled settings	0000h
127	Removable Media Status Notification feature set (Obsolete ATA8)	0000h
128	Security status	0021h (default)
	15-9 Reserved 8 0b = Security level High, 1b = Maximum 7-6 Reserved 5 1b = Enhanced security erase supported 4 0b = Security count ready, 1b = Expired 3 0b = Security selectable, 1b = frozen 2 0b = Security unlock, 1b = Locked 1 0b = Security disabled, 1b = Enabled 0 1b = Security supported	
129-159	Vendor Specific	0000h
160	CFA power mode	0000h
161-167	Reserved for the CompactFlash Association	0000h
168	Device Nominal Form Factor	0003h 0004h

	15-4 Reserved
	3-0 Device Nominal Form Factor
	    1h = 5.25 inch nominal form factor
	    2h = 3.25 inch nominal form factor
	    3h = 2.5 inch nominal form factor
	    4h = 1.8 inch nominal form factor
	    5h = Less than 1.8 inch nominal form factor	

WORD	Description	Hex
169	DATA SET MANAGEMENT command function supported	00001h
	15-1 Reserved 0 1b = Trim bit is supported	
170-173	Additional Product Identifier (Option)	ASCII/ 0000h
174-175	Reserved	0000h
176-205	Current media serial number	0000h
206	SCT Command Transport	0039h
	15-12 Vendor Specific 11-6 Reserved 5 1b = SCT Data Tables command is supported 4 1b = SCT Feature Control command is supported 3 1b = SCT Error Recovery Control command is supported 2 0b = Not support SCT Write Same command 1 0b = Not support SCT Read/Write Long command *(Obsolete on ATA8)* 0 1b = SCT command Transport is supported	
207-208	Reserved for CE-ATA	0000h
209	Alignment of logical blocks within a physical block	4000h
	15-14 01b = Support this word signature 13-0 Logical sector offset within the first physical sector where the first logical sector is placed	
210-211	Write-Read-Verify Sector Count Mode 3	0000h
212-213	Write-Read-Verify Sector Count Mode 2	0000h
214	NV Cache Capabilities	0000h
215-216	NV Cache Size in Logical Blocks	0000h
217	Nominal media rotation rate	0001h
	15-0 0001h = Solid State Device	
218	Reserved	0000h
219	NC Cache Options	0000h
220	Write-Read-Verify feature set current mode	0000h
221	Reserved	0000h
222	Transport major version number	101Fh
	15-12 1h = Serial Transport Type 11-6 Reserved 5 0b = Reserved for SATA Revision 3.0 4 1b = SATA Revision 2.6 3 1b = SATA Revision 2.5 2 1b = SATA II: Extensions 1 1b = SATA 1.0a 0 1b = ATA-8 AST	
223	Transport minor version number	0000h
	15-0 0000h = Minor version not reported	
224-233	Reserved for CE-ATA	0000h
234	Minimum number of 512-byte data blocks per DOWNLOAD MICROCODE command for mode 3	0001h
235	Minimum number of 512-byte data blocks per DOWNLOAD MICROCODE command for mode 3	00FFh
236-242	Reserved	
243	Security feature	0000h (4000h)
	15 0b (Fixed) 14 FDE function [0b: Not support, 1b: Support (Option)] 13-0 Reserved	
244-254	Reserved	0000h
255	Integrity word	xxA5h
	15-8 Checksum 7-0 Signature	

Security Feature Set

The Security features allow the host to implement a security password system to prevent unauthorized access to the drive.

Following Commands are supported for this feature set.

- SECURITY SET PASSWORD
- SECURITY UNLOCK
- SECURITY ERASE PREPARE
- SECURITY ERASE UNIT
- SECURITY FREEZE LOCK
- SECURITY DISABLE PASSWORD

Parameter word for the Security feature set is described in IDENTIFY DEVICE response Word 128.

Security default setting

The drive is shipped with the master password set to 00h value (null) and the lock function disabled. The system manufacturer/dealer may set a new master password by using the SECURITY SET PASSWORD command, without enabling the lock function.

If the Master Password Revision Code feature is supported, the Master Password Revision Code is initially set to FFFEh.

Initial setting of the user password

When a user password is set, the drive automatically enters Locked mode by the next Power-on Reset.

Security command actions

This command table shows the drive's response to commands when the Security Function is enabled.

Security command actions

Command	Disable mode	Unlocked mode	Locked mode	Frozen mode
CHECK POWER MODE	O	O	O	O
DATA SET MANAGEMENT	O	O	X	O
DEVICE CONFIGURATION OVERLAY	O	O	X	O
DOWNLOAD MICROCODE	O	X	X	X
EXECUTE DEVICE DIAGNOSTIC	O	O	O	O
FLUSH CACHE / FLUSH CACHE EXT	O	O	X	O
IDENTIFY DEVICE	O	O	O	O
IDLE / IDLE IMMEDIATE	O	O	O	O
INITIALIZE DEVICE PARAMETERS	O	O	O	O
NOP	O	O	O	O
READ BUFFER	O	O	O	O
READ DMA / READ DMA EXT	O	O	X	O
READ DMA without retry	O	O	X	O
READ FPDMA QUEUED	O	O	X	O
READ LOG EXT / READ LOG DMA EXT	O	O	O	O
READ MULTIPLE / READ MULTIPLE EXT	O	O	X	O
READ NATIVE MAX ADDRESS	O	O	O	O
READ NATIVE MAX ADDRESS EXT	O	O	O	O
READ SECTOR(S) / READ SECTOR(S) EXT	O	O	X	O
READ SECTOR(S) without retry	O	O	X	O
READ VERIFY SECTOR(S)	O	O	X	O
READ VERIFY SECTOR(S) EXT	O	O	X	O
READ VERIFY SECTOR(S) without retry	O	O	X	O
RECALIBRATE	O	O	O	O
SECURITY DISABLE PASSWORD	O	O	X	X
SECURITY ERASE PREPARE	O	O	O	X
SECURITY ERASE UNIT	O	O	O	X
SECURITY FREEZE LOCK	O	O	X	O
SECURITY SET PASSWORD	O	O	X	X
SECURITY UNLOCK	O	O	O	X
SEEK	O	O	O	O
SET FEATURES	O	O	O	O
SET MAX / SET MAX ADDRESS EXT	O	O	X	O
SET MULTIPLE MODE	O	O	O	O
SLEEP	O	O	O	O
SMART	O	O	O	O
STANDBY / STANDBY IMMEDIATE	O	O	O	O
WRITE BUFFER	O	O	O	O
WRITE DMA / WRITE DMA EXT	O	O	X	O
WRITE DMA without retry	O	O	X	O
WRITE DMA FUA EXT	O	O	X	O
WRITE FPDMA QUEUED	O	O	X	O
WRITE LOG EXT / WRITE LOG DMA EXT	O	O	X	O
WRITE MULTIPLE WRITE MULTIPLE EXT	O	O	X	O
WRITE MULTIPLE FUA EXT	O	O	X	O
WRITE SECTOR(S) / WRITE SECTORS(S) EXT	O	O	X	O
WRITE SECTOR(S) without retry	O	O	X	O
WRITE UNCORRECTABLE EXT	O	O	X	O

O: Drive executes command normally
X: Drive rejects command with an Aborted command error

Self-Monitoring, Analysis and Reporting Technology

Self-monitoring, analysis and reporting technology (SMART) is the function to protect user data and to minimize the likelihood of unscheduled system downtime that may be caused by predictable degradation and/or fault of the drive. By monitoring and storing the critical performance and calibration parameters, SMART drives attempt to predict the likelihood of near-term degradation or fault condition. The host system warns the user of the impending risk of data loss and advises the user of appropriate action by informing the host system of the negative reliability.

SMART commands use a single command code and are differentiated by the value placed in the Features register.

The Commands supported by this feature set are:

- SMART READ DATA (D0h)
- SMART READ ATTRIBUTE THRESHOLDS (D1h)
- SMART ENABLE/DISABLE ATTRIBUTE AUTOSAVE (D2h)[1]
- SMART SAVE ATTRIBUTE VALUES (D3h)
- SMART EXECUTE OFF-LINE IMMEDIATE (D4h/00h,01h,02h,04h,7Fh,81h,82h,84h)
- SMART READ LOG (D5h/09h)
- SMART WRITE LOG (D6h/09h)
- SMART ENABLE OPERATIONS (D8h)
- SMART DISABLE OPERATIONS (D9h)
- SMART RETURN STATUS (DAh)
- SMART ENABLE/DISABLE AUTOMATIC OFF-LINE (DBh/00H,F8h)

Note[1]: Attribute autosave feature is always active. This command does not cause the drive to change attribute autosave feature. Even if this command is issued with "disable," the request will complete successfully with no effect.

Attribute

Attributes are the specific performance or calibration parameters that are used in analyzing the status of the drive. Attributes are selected by the drive manufacturer based on that attribute's ability to predict degrading or faulty conditions for that particular drive.

ID	Attribute Name
1	Read Error Rate
2	Throughput Performance
3	Spin Up Time
5	Reallocated Sector Count
7	Seek Error Rate
8	Seek Time Performance
9	Power-on Hours Count
10	Spin Retry Count
12	Drive Power Cycle Count
167	SSD Protect Mode
168	SATA PHY Error Count
169	Bad Block Count
173	Erase Count
175	Bad Cluster Count
192	Unexpected Power Loss Count
194	Temperature[1]
197	Current Pending Sector Count
240	Write Head

Note[1]: Temperature value updates after 4 seconds from Power-on.

Attribute values

Attribute values are used to measure the relative reliability of individual performance or calibration attributes.

Attribute values table has 12 bytes entry as follows;

Individual attribute data structure

Offset	Field	Size	Description	
0	Attribute	1	Attribute Code	
1	Flags	2	Bit 0	Pre-failure Warranty
			Bit 1	Online Collection
			Bit 2	Performance Attribute type
			Bit 3	Error Rate Attribute type
			Bit 4	Event Count Attribute type
			Bit 5	Self-Preserving Attribute type
			Other	Reserved
3	Value	1	01h	Minimum value
			64h	Initial value
			FDh	Maximum value
4	Worst Value	1	Worst value in saved data	
5	Raw Value	6	One or three numeric value	
11	Reserved	1	Reserved	

Attribute thresholds

A threshold exceeded condition occurs when the device's SMART reliability status indicates an impending degrading or fault condition.

Attribute threshold table has 12 bytes entry as follows;

Individual threshold data structure

Offset	Field	Size	Description	
0	Attribute	1	Attribute Code	
1	Threshold	1	00h	Always passing value
			01h	Minimum value
			FDh	Maximum value
			FEh	Invalid value (not used)
			FFh	Always failing value
2	Reserved	10	Reserved	

Attribute value and Threshold value matrix

Attribute ID		Flash	Attribute Name	Initial Value	Threshold	RAW Value
1	01h	000Ah	Read Error Rate	64h(Fixed)	00h	0(Fixed)
2	02h	0005h	Throughput Performance	64h(Fixed)	32h	0(Fixed)
3	03h	0007h	Spin Up Time	64h(Fixed)	32h	0(Fixed)
5	05h	0013h	Reallocated Sector Count	64h(Fixed)	32h	0(Fixed)
7	07h	000Bh	Seek Error Rate	64h(Fixed)	32h	0(Fixed)
8	08h	0005h	Seek Time Performance	64h(Fixed)	32h	0(Fixed)
9	09h	0012h	Power-on Hours Count	64h(Fixed)	00h	32 bit number
10	0Ah	0013h	Spin Retry Count	64h(Fixed)	32h	0(Fixed)
12	0Ch	0012h	Drive Power Cycle Count	64h(Fixed)	00h	32 bit number
167	A7h	0022h	SSD Protect Mode	64h(Fixed)	00h	48 bit number
168	A8h	0012h	SATA PHY Error Count	64h(Fixed)	00h	48 bit number
169	A9h	0013h	Bad Block Count	64h	0Ah	0(Fixed)
173	ADh	0012h	Erase Count	C8h	00h	0(Fixed)
175	AFh	0013h	Bad Cluster Count	64h	0Ah	0(Fixed)
192	C0h	0012h	Unexpected Power Loss Count	64h(Fixed)	00h	32 bit number
194	C2h	0023h	Temperature	64h	1Eh	3 Words
197	C5h	0012h	Current Pending Sector Count	64h(Fixed)	00h	0(Fixed)
240	F0h	0013h	Write Head	64h(Fixed)	32h	0(Fixed)

Note: Threshold value reports "SMART READ ATTRIBUTE THRESHOLDS (B0h/D1h)" command

Error logging
The drive can report specific error information with SMART log function.

Self-Test
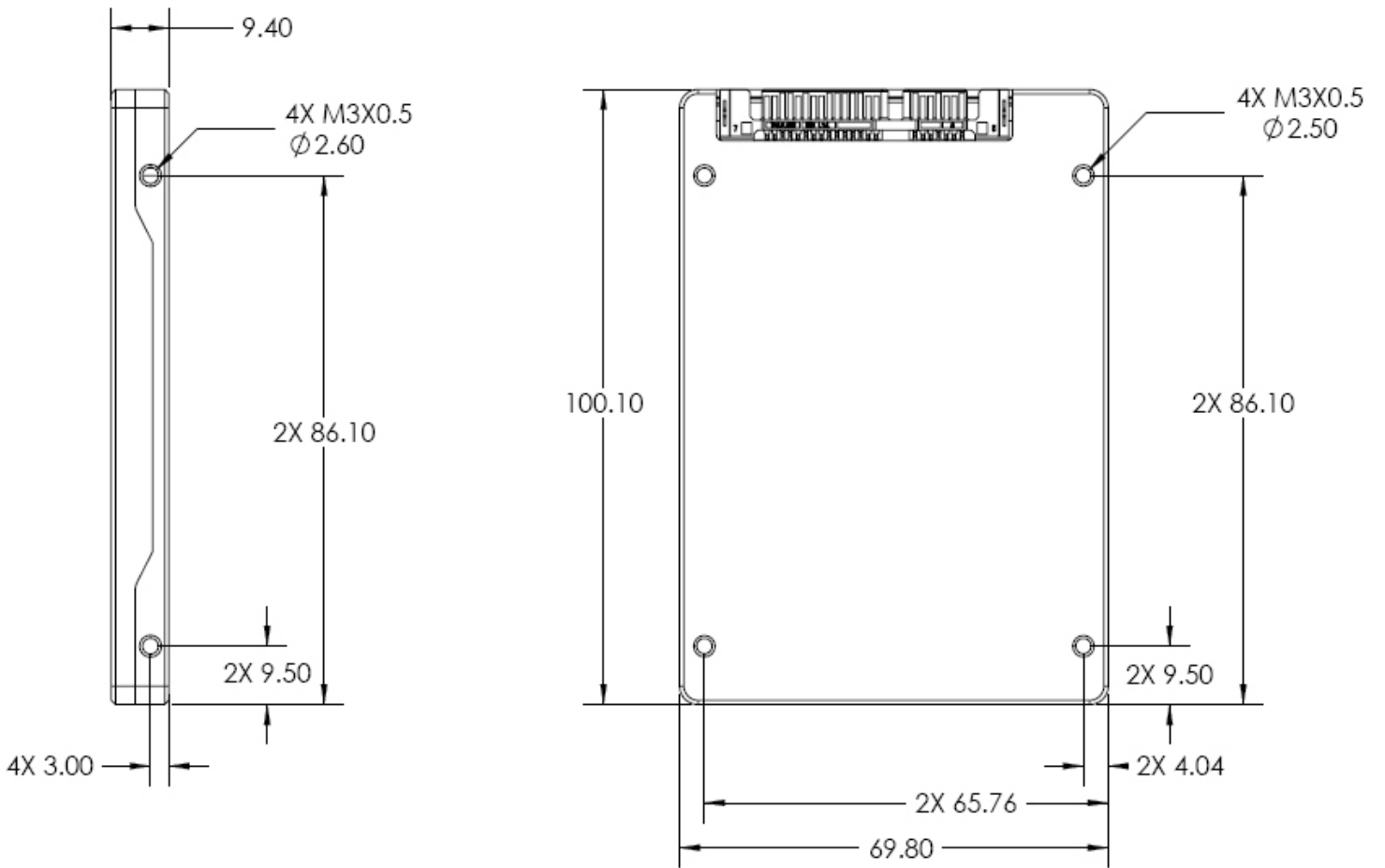The drive supports SMART Self-Test function.

Off-line read scanning
The drive supports Background Self-Test function.

SMART function default setting
The drives are shipped from the drive manufacturer's factory with the SMART feature enabled.

Form Factor Dimensions (measurement in mm.)

9.40

4X M3X0.5
Ø2.60

4X M3X0.5
Ø2.50

2X 86.10

2X 86.10

100.10

2X 9.50

2X 9.50

4X 3.00

2X 4.04

2X 65.76

69.80

Kingston SSDNow V+ series Mechanical Drawing