

# **Amtron Technology, Inc.**

## **Industrial Grade 2.5" SATA III SSD AC Series Product Datasheet**

V1.3

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## 1. INTRODUCTION

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### 1.1. General Description

Amtron industrial grade AC series 2.5" SATA SSD delivers all the advantages of flash disk technology with Serial ATA I/II/III interface, with features of low power consumption and hot-swapping when removing, replacing, upgrading flash disks. The device is designed based on the standard 7-pin interface for data segment and 15-pin for power segment.

Amtron AC series 2.5" SATA SSDs are available in a wide range from 16GB up to 2TB. It can reach high performance of up to 550MB/s read and 500MB/s write speed.

### 1.2. Product Features

- 3D TLC NAND flash
- RoHS compliant [Lead free]
- Compliant with SATA Specification 3.2
- Compatible with SATA 1.5Gbps, 3Gbps and 6Gbps interface
- Support ATA-8 command set
- High speed:  
Read: 550 MB/s max., Write: 500 MB/s max.
- Endure severe thermal and dynamic environments
  - Operation Temperature (Wide grade): -40°C to 85°C
  - Shock: 1500g
  - Vibration: 20g
- Very low power consumption
- MTBF: 3,000,000 hours
- Support S.M.A.R.T. Command
- Optional features
  - Power Loss Protection
- Controlled Bill of Materials (BOM )

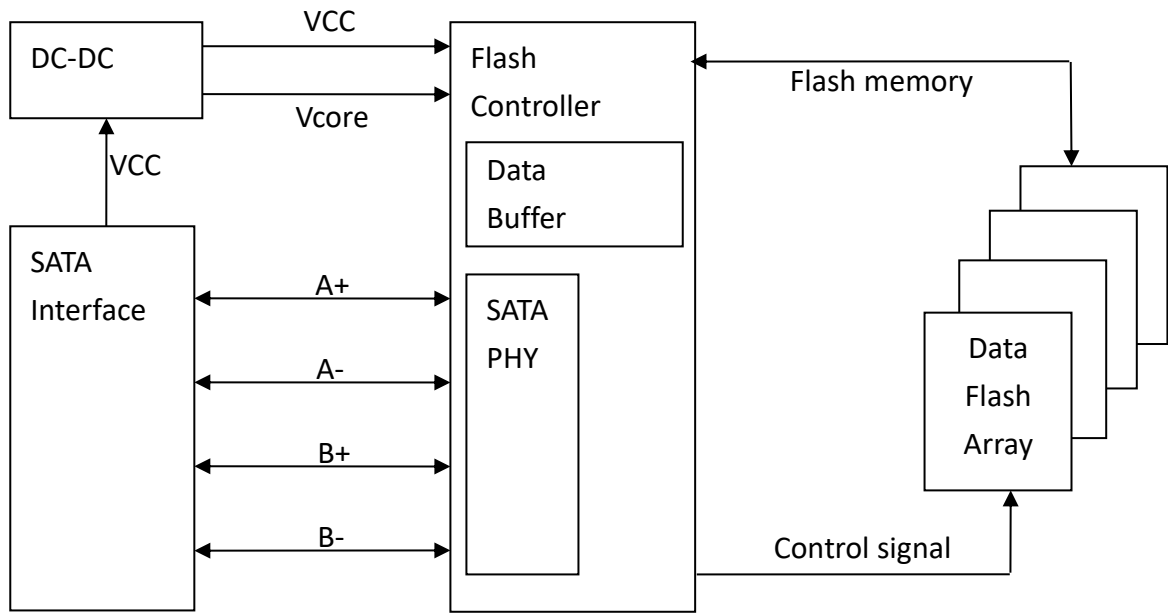
### 1.3. Product Overview

- **Capacity**
  - TLC: 120GB to 1920GB
  - pSLC: 20GB (16GB) to 640GB (512GB)
- **SATA Interface**
  - SATA Revision 3.2
  - SATA 1.5Gbps, 3Gbps, and 6Gbps interface
- **Flash Interface**
  - Flash Type: 3D TLC
- **Performance**
  - Read up to 550 MB/s
  - Write up to 500 MB/s
- **Power Consumption**<sup>2</sup>
  - Active mode: < 1,650 mW
  - Idle mode: < 330 mW
- **Low Power Management**
  - DIPM/HIPM Mode
  - DEVSLP Mode (optional)
- **MTBF**<sup>1</sup>
  - 3,000,000 hours
- **Advanced Flash Management**
  - Bad Block Management
  - TRIM
  - SMART
  - Over-Provision
- **Temperature Range**
  - Operation (Standard): 0°C to 70°C
  - Operation (Wide): -40°C to 85°C
  - Storage: -40°C ~ 85°C
- **Optional Features**
  - Power Loss Protection (PLP)
  - Advanced Encryption Standard (AES)
  - Thermal Sensor (T/S)
  - Write Protection
  - Quick Erase
  - DEVSLP
- **Compliant**
  - RoHS
  - CE & FCC

#### Notes:

1. MTBF, an acronym for Mean Time between Failures, is a measure of a device's reliability. Its value represents the average time between a repair and the next failure. The measure is typically in unit of hours. The higher the MTBF value, the higher the reliability of the product.
2. Please see Section 4.2 "Power Consumption" for details.

1.4. Block Diagram



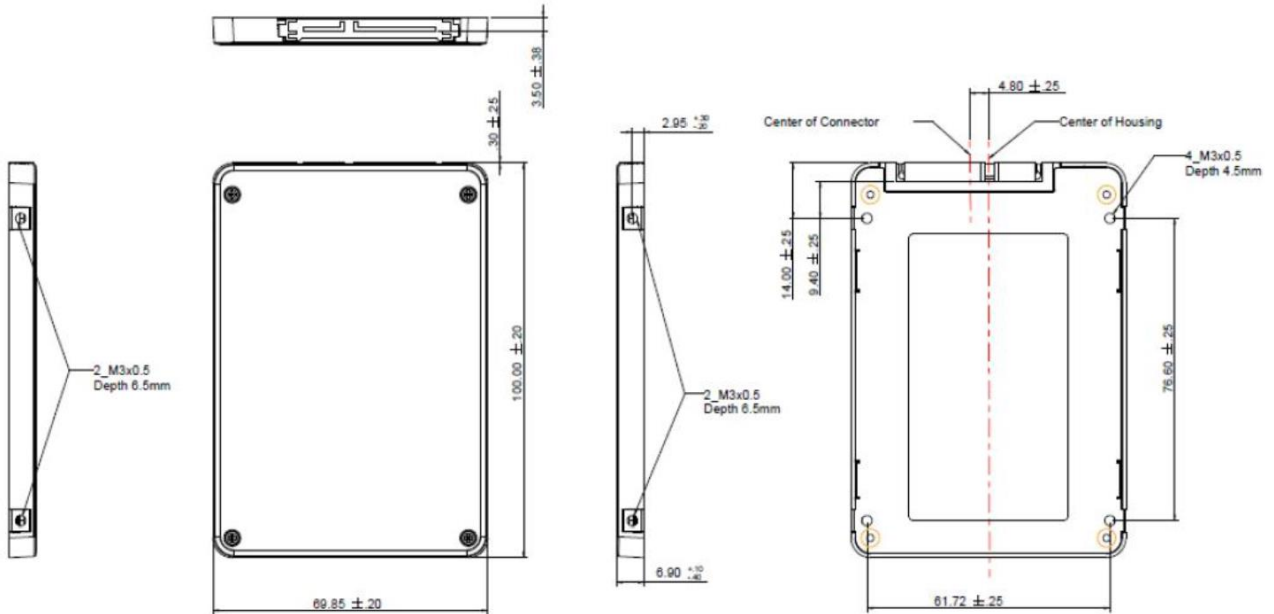
2.5" SATA SSD Block Diagram

## 2. PRODUCT SPECIFICATIONS



### 2.1. Product Dimension

Dimension: 100.00mm (L) x 69.85mm (W) x 6.90mm (H)



## 2.2. Capacity and Performance

- **Capacity**
  - TLC: 120GB up to 1,920GB (support 48-bit addressing mode)
  - pSLC: 20GB(16GB) up to 640GB(512GB) (support 48-bit addressing mode)
- **Electrical/Physical Interface**
  - SATA Interface
    - ◆ Compliant with SATA Revision 3.2
    - ◆ Compatible with SATA 1.5Gbps, 3Gbps and 6Gbps interface
    - ◆ Support ATA-8 command set
- **Built-in 4-channel NAND flash interface controller**
  - Enhanced endurance by dynamic/static wear-leveling
  - AgileECC 2 which includes:
    - ◆ Hardware-based V.P.R (Virtual Parity Recovery)
    - ◆ Support 2K Byte code-word length
    - ◆ Support Shift read/Read Retry feature of NAND flash
    - ◆ Read Disturb protection
    - ◆ Data integrity under power-cycling
- **Supported NAND Flash**
  - Support Toggle 2.0 and ONFi 4.0 all types of 3D-NAND, up to 667MHz
- **Support SMART and TRIM commands**
- **Support Hardware Power Loss Protection (Optional)**
- **Support AES 256 bit**
- **Thermal Sensor**
- **Capacity Information**

Capacity	Cylinders	Heads	Sectors	Total Sectors	User Data Size
20GB	16,383	16	63	39,091,248	Depended on file management
40GB	16,383	16	63	78,161,328	
80GB	16,383	16	63	156,301,488	
120GB	16,383	16	63	234,441,648	
160GB	16,383	16	63	312,581,808	
240GB	16,383	16	63	468,862,128	
320GB	16,383	16	63	625,142,448	
480GB	16,383	16	63	937,703,088	

640GB	16,383	16	63	1,250,263,728	
960GB	16,383	16	63	1,875,385,008	
1,920GB	16,383	16	63	3,750,748,848	

● **Performance**

Capacity	Flash Type	Sequential	
		Read (MB/s)	Write (MB/s)
120GB	BiCS5, BGA, 512Gb	550	220
240GB	BiCS5, BGA, 512Gb	550	385
480GB	BiCS5, BGA, 512Gb	550	500
960GB	BiCS5, BGA, 512Gb	550	500
1,920GB	BiCS5, BGA, 512Gb	550	500
20GB	BiCS5 pSLC, BGA, 512Gb	280	270
40GB	BiCS5 pSLC, BGA, 512Gb	550	220
80GB	BiCS5 pSLC, BGA, 512Gb	550	400
160GB	BiCS5 pSLC, BGA, 512Gb	550	500
320GB	BiCS5 pSLC, BGA, 512Gb	550	500
640GB	BiCS5 pSLC, BGA, 512Gb	550	500

**Notes:**

1. The performance was estimated based on 3D NAND flash.
2. Performance may differ according to flash configuration and platform.
3. The table above is for reference only.

● **TBW (Terabytes Written)**

Capacity	Flash Type	TBW
120GB	BiCS5, BGA, 512Gb	270
240GB	BiCS5, BGA, 512Gb	540
480GB	BiCS5, BGA, 512Gb	1020
960GB	BiCS5, BGA, 512Gb	1400
1,920GB	BiCS5, BGA, 512Gb	2940
20GB	BiCS5 pSLC, BGA, 512Gb	1440
40GB	BiCS5 pSLC, BGA, 512Gb	3170
80GB	BiCS5 pSLC, BGA, 512Gb	6580
160GB	BiCS5 pSLC, BGA, 512Gb	13365
320GB	BiCS5 pSLC, BGA, 512Gb	26330
640GB	BiCS5 pSLC, BGA, 512Gb	45880



**Notes:**

1. Samples were built using 3D NAND flash.
2. The test followed JEDEC219A client endurance workload.
3. TBW may differ according to flash configuration and platform.
4. The endurance of SSD could be estimated based on user behavior, NAND endurance cycles, and write amplification factor. It is not guaranteed by flash vendor.

## 2.3. Feature Descriptions

### 2.3.1. Power Loss Protection (PLP)

If the voltage supply is cut, for instance, accidental power off or sudden blackout, the data would be shortly lost. To protect SSD data integrity from this disastrous scenario, Amtron has developed the hardware-based technology named PLP (Power Loss Protection). The PLP equips SSDs with tantalum capacitors that can deliver urgent power current so that the flash controller can take this extended moment to flush cached data and essential metadata into NAND Flash blocks.

In addition to tantalum capacitors which guarantee SSD data integrity, an inbuilt IC detector also serves the same purpose as well as ensures the stability of data transmission. The detector is designed to take proactive measures for the aforementioned disastrous scenario. When supply voltage drops below a minimum threshold, the detector will send out signals to the flash controller notifying it to stop operating to prevent poor performance or erratic operation. In the meanwhile, signals will also be sent to DRAM to have cached data flushed into NAND Flash blocks so as to avoid data loss, similar to the function performed by tantalum capacitors.

AC series SSD is equipped with tantalum capacitors which have lower power leakage, higher operating temperature and higher volume-efficiency (high capacitance in small volume) than many other types of capacitors. The compact size and the high reliability are ideal for embedded computing systems.

### 2.3.2. Advanced Encryption Standard (AES)

Advanced Encryption Standard (AES) is a specification for the encryption of electronic data. AES has been adopted by the U.S. government since 2001 to protect classified information and is now widely implemented in embedded computing applications. The AES algorithm used in software and hardware is symmetric so that encrypting/decrypting requires the same encryption key. Without the key, the encrypted data is inaccessible to ensure information security.

Notably in flash memory applications, AES 256-bit hardware encryption is the mainstream to protect sensitive or confidential data. The hardware encryption provides better performance, reliability, and security than software encryption. It uses a dedicated processor, which is built inside the controller, to process the encryption and decryption. This enormously shortens the processing time and makes it efficient.

**2.3.3. Thermal Sensor (T/S)**

Thermal Sensor is a digital temperature sensor with serial interface. By using a designated pin for transmission, storage device owners are able to read temperature data.

**2.4. Compliance**

- SATA III (SATA Rev. 3.2)
- Up to ATA/ATAPI-8 (Including S.M.A.R.T)

### 3. ENVIRONMENTAL SPECIFICATIONS



Parameter	Type	Specifications
Temperature	Operation	0°C to 70°C (Standard); -40°C to 85°C (Wide)
	Non-operational	-55°C to 100°C
Vibration	Operation	7.69 GRMS, 20~2000 Hz/random (compliant with MIL-STD-810G)
	Non-operational	4.02 GRMS, 15~2000 Hz/random (compliant with MIL-STD-810G)
Shock	Operation	Acceleration, 50(G)/11(ms)/half sine (compliant with MIL-STD-202G)
	Non-operational	Acceleration, 1500(G)/0.5(ms)/half sine (compliant with MIL-STD-883K)

#### 3.1. Certification

- RoHS
- CE / FCC

## 4. ELECTRICAL SPECIFICATIONS



### 4.1. Supply Voltage

Parameter	Rating
Operating Voltage	5V , ±5%

### 4.2. Power Consumption

Capacity	Flash Type	Active	Idle
120GB	BiCS5, BGA, 512Gb	1,225	250
240GB	BiCS5, BGA, 512Gb	1,325	250
480GB	BiCS5, BGA, 512Gb	1,425	250
960GB	BiCS5, BGA, 512Gb	1,375	250
1,920GB	BiCS5, BGA, 512Gb	1,375	250
20GB	BiCS5 pSLC, BGA, 512Gb	925	225
40GB	BiCS5 pSLC, BGA, 512Gb	1,275	250
80GB	BiCS5 pSLC, BGA, 512Gb	1,300	250
160GB	BiCS5 pSLC, BGA, 512Gb	1,650	300
320GB	BiCS5 pSLC, BGA, 512Gb	1,500	250
640GB	BiCS5 pSLC, BGA, 512Gb	1,425	275

Unit: mW

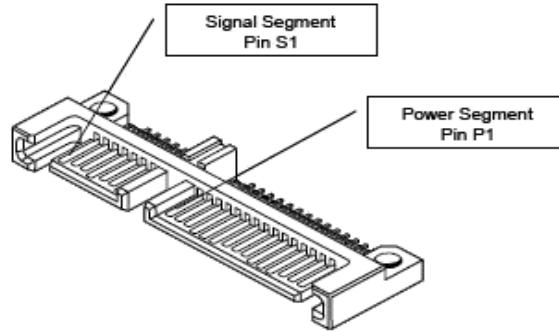
#### Notes:

1. The measured power voltage is 5V.
2. Samples were built using 3D NAND flash and measured under normal temperature.
3. Sequential R/W is measured while testing 1000MB sequential R/W 5 times by CrystalDiskMark.
4. Power Consumption may differ according to flash configuration and platform.

5. INTERFACE



5.1. Pin Assignment and Descriptions



<b>Signal Segment Pin Assignment</b>	<b>Pin Number</b>	<b>Function</b>
	S1	GND
	S2	A+ (Differential Signal Pair A)
	S3	A – (Differential Signal Pair A)
	S4	GND
	S5	B – (Differential Signal Pair B)
	S6	B+ (Differential Signal Pair B)
	S7	GND
<b>Power Segment Pin Assignment</b>	<b>Pin Number</b>	<b>Function</b>
	P1	Not Used (3.3V)
	P2	Not Used (3.3V)
	P3	DEVSLP
	P4	GND
	P5	GND
	P6	GND
	P7	5V
	P8	5V
	P9	5V
	P10	GND
	P11	Reserved for DAS LED
	P12	GND
	P13	Not Used (12V pre-charge)
	P14	Not Used (12V)
P15	Not Used (12V)	

## 6. SUPPORTED COMMANDS



### 6.1. ATA Command List

Op-Code	Command Description	Op-Code	Command Description	
00h	NOP	60h	Read FPDMA Queued	
06h	Data Set Management	61h	Write FPDMA Queued	
10h	Recalibrate	70h	Seek	
20h	Read Sectors	90h	Execute Device Diagnostic	
21h	Read Sectors without Retry	91h	Initialize Device Parameters	
24h	Read Sectors EXT	92h	Download Microcode	
25h	Read DMA EXT	93h	Download Microcode DMA	
27h	Read Native Max Address EXT	B0h	SMART	
29h	Read Multiple EXT	B0h	D0h	SMART READ DATA
2Fh	Read Log EXT	B0h	D1h	SMART READ DATA ATTRIBUTE THRESHOLD
30h	Write Sectors	B0h	D2h	SMART ENABLE/DISABLE ATTRIBUTE AUTOSAVE
31h	Write Sectors without Retry	B0h	D3h	SMART SAVE ATTRIBUTE VALUES
34h	Write Sectors EXT	B0h	D4h	SMART EXECUTE OFF-LINE IMMEDIATE
35h	Write DMA EXT	B0h	D5h	SMART READ LOG
37h	Set Native Max Address EXT	B0h	D6h	SMART WRITE LOG
39h	Write Multiple EXT	B0h	D8h	SMART ENABLE OPERATIONS
3Dh	Write DMA FUA EXT	B0h	D9h	SMART DISABLE OPERATIONS
3Fh	Write Long EXT	B0h	DAh	SMART RETURN STATUS
40h	Read Verify Sectors	B0h	DBh	SMART ENABLE/DISABLE AUTOMATIC OFF-LINE
41h	Read Verify Sectors without Retry	B1h		DEVICE CONFIGURATION OVERLAY
42h	Read Verify Sectors EXT	B1h	C0h	DEVICE CONFIGURATION RESTORE
45h	Write Uncorrectable EXT	B1h	C1h	DEVICE CONFIGURATION FREEZE LOCK
47h	Read Log DMA EXT	B1h	C2h	DEVICE CONFIGURATION IDENTIFY
57h	Write Log DMA EXT	B1h	C3h	DEVICE CONFIGURATION SET
B1h	C4h	DEVICE CONFIGURATION IDENTIFY DMA	ECh	Identify Device
B1h	C5h	DEVICE CONFIGURATION SET DMA	EFh	Set Features
C4h	Read Multiple	EFh	02h	Enable 8-bit PIO transfer mode
Op-Code	Command Description	Op-Code	Command Description	

C5h	Write Multiple	EFh	03h		Set transfer mode based on value in Count field
C6h	Set Multiple Mode	EFh	05h		Enable advanced power management
C8h	Read DMA	EFh	10h		Enable use of Serial ATA feature
C9h	Read DMA without Retry	EFh	10h	02h	Enable DMA Setup FIS Auto-Activate optimization
CAh	Write DMA	EFh	10h	03h	Enable Device-initiated interface power state (DIPM) transitions
CBh	Write DMA without Retry	EFh	10h	06h	Enable Software Settings Preservation (SSP)
CEh	Write Multiple FUA EXT	EFh	10h	07h	Enable Device Automatic Partial to Slumber transitions
E0h	Standby Immediate	EFh	10h	09h	Enable Device Sleep
E1h	Idle Immediate	EFh	55h		Disable read look-ahead feature
E2h	Standby	EFh	66h		Disable reverting to power-on defaults
E3h	Idle	EFh	82h		Disable write cache
E4h	Read Buffer	EFh	85h		Disable advanced power management
E5h	Check Power Mode	EFh	90h		Disable use of Serial ATA feature set
E6h	Sleep	EFh	90h	02h	Disable DMA Setup FIS Auto-Activate optimization
E7h	Flush Cache	EFh	90h	03h	Disable Device-initiated interface power state (DIPM) transitions
E8h	Write Buffer	EFh	90h	06h	Disable Software Settings Preservation (SSP)
E9h	Read Buffer DMA	EFh	90h	07h	Disable Device Automatic Partial to Slumber transitions
EAh	Flush Cache EXT	EFh	90h	09h	Disable Device Sleep
EBh	Write Buffer DMA	EFh	AAh		Enable read look-ahead feature
EFh	CCh	Enable reverting to power-on defaults		F4h	Security Erase Unit
F1h	Security Set Password		F5h		Security Freeze Lock
F2h	Security Unlock		F6h		Security Disable Password
F3h	Security Erase Prepare		F8h		Read Native Max Address

## 6.2. Identify Device Data

The following table details the sector data returned by the IDENTIFY DEVICE command.

Word	F: Fixed V: Variable X: retired/obsolete /reserved	Default Value	Description
0	F	0040h	General configuration bit-significant information
1	X	*1	Obsolete – Number of logical cylinders
2	F	C837h	Specific configuration
3	X	0010h	Obsolete – Number of logical heads (16)
4-5	X	00000000h	Retired
6	X	003Fh	Obsolete – Number of logical sectors per logical track (63)
7-8	X	00000000h	Reserved for assignment by the Compact Flash Association
9	X	0000h	Retired
10-19	V	Varies	Serial number (20 ASCII characters)
20-21	X	0000h	Retired
22	X	0000h	Obsolete
23-26	V	Varies	Firmware revision (8 ASCII characters)
27-46	V	Varies	Model number (xxxxxxxx)
47	F	8010h	7:0- Maximum number of sectors transferred per interrupt on MULTIPLE commands
48	F	4000h	Reserved
49	F	2F00h	Capabilities
50	F	4000h	Capabilities
51-52	X	000000000h	Obsolete
53	F	0007h	Words 88 and 70:64 valid
54	X	*1	Obsolete – Number of logical cylinders
55	X	0010h	Obsolete – Number of logical heads (16)
56	X	003Fh	Obsolete – Number of logical sectors per track (63)
57-58	X	*2	Obsolete – Current capacity in sectors
59	F	0110h	Number of sectors transferred per interrupt on MULTIPLE commands
60-61	V	*3	Maximum number of sector ( 28bit LBA mode)
62	X	0000h	Obsolete
63	F	0407h	Multi-word DMA modes supported/selected



Word	F: Fixed V: Variable X: retired/obsolete /reserved	Default Value	Description
64	F	0003h	PIO modes supported
65	F	0078h	Minimum Multiword DMA transfer cycle time per word
66	F	0078h	Manufacturer's recommended Multiword DMA transfer cycle time
67	F	0078h	Minimum PIO transfer cycle time without flow control
68	F	0078h	Minimum PIO transfer cycle time with IORDY flow control
69	F	1F00h	Additional Supported
70	X	0000h	Reserved
71-74	X	000000000000 0000h	Reserved for the IDENTIFY PACKET DEVICE command
75	F	001Fh	Queue depth
76	F	850Eh	Serial SATA capabilities
77	F	0006h	Supported Serial ATA Phy speed
78	F	004Ch	Serial ATA features supported
79	F	0040H	Serial ATA features enabled
80	F	0FF8h	Major Version Number
81	F	0000h	Minor Version Number
82	F	746Bh	Command set supported
83	F	7D01h	Command set supported
84	F	4163h	Command set/feature supported extension
85	F	7469h	Command set/feature supported or enabled
86	F	BC01h	Command set/feature supported or enabled
87	F	4163h	Command set/feature supported or enabled
88	F	007Fh	Ultra DMA Modes
89	F	000Ah	Time required for Normal Erase mode SECURITY ERASE UNIT command
90	F	001Eh	Time required for an Enhanced Erase mode SECURITY ERASE UNIT command
91	F	0000h	Current advanced power management value
92	F	FFFEh	Master Password Revision Code
93	F	0000h	Hardware reset result. The contents of the bits (12:0) of this word can be changed only during the execution of hardware reset.

Word	F: Fixed V: Variable X: retired/obsolete /reserved	Default Value	Description
94	X	0000h	Vendor's recommended and actual acoustic management value
95	F	0000h	Stream Minimum Request Size
96	F	0000h	Streaming Transfer Time – DMA
97	F	0000h	Streaming Access Latency – DMA and PIO
98-99	F	0000h	Streaming Performance Granularity
100-103	V	*4	Maximum user LBA for 48 bit Address feature set
104	F	0000h	Streaming Transfer Time – PIO
105	F	0008h	Maximum number of 512-byte blocks per DATA SET MANAGEMENT command
106	F	4000h	Physical sector size/Logical sector size
107	F	0000h	Inter-seek delay for ISO-7779 acoustic testing in microseconds
108-111	F	Varies	Reserved
112-115	X	000000000000 0000h	Reserved
116	X	0000h	Reserved
117-118	F	00000000h	Words per logical Sector
119	F	401Ch	Supported settings
120	F	401Ch	Command set/Feature Enabled/Supported
121-126	X	0h	Reserved
127	X	0h	Obsolete
128	F	0021h	Security status
129-159	V	Varies	Vendor specific
160	X	0h	Compact Flash Association (CFA) power mode 1
161-167	X	0h	Reserved for assignment by the CFA
168	V	Varies	Device Nominal Form Factor
169	F	0001h	DATA SET MANAGEMENT command is supported
170-173	F	0h	Additional Product Identifier
174-175	X	0h	Reserve
176-205	F	0h	Current media serial number
206	F	0039h	SCT Command Transport

Word	F: Fixed V: Variable X: retired/obsolete /reserved	Default Value	Description
207-208	X	0h	Reserved
209	F	4000h	Alignment of logical blocks within a physical block
210-211	F	0000h	Write-Read-Verify Sector Count Mode 3 (not support)
212-213	F	0000h	Write-Read-Verify Sector Count Mode 2 (not support)
214-216	X	0000h	NV Cache relate (not support)
217	F	0001h	Non-rotating media device
218	X	0h	Reserved
219	X	0h	NV Cache relate (not support)
220	V	0h	Write read verify feature set current mode
221	X	0h	Reserved
222	F	10FFh	Transport major version number
223	F	0h	Transport minor version number
224-229	X	0h	reserved
230-233	F	0h	Extend number of user addressable sectors
234	F	0001h	Minimum number of 512-byte data blocks per DOWNLOAD MICROCODE command for mode 03h
235	F	FFFEh	Maximum number of 512-byte data blocks per DOWNLOAD MICROCODE command for mode 03h
236-242	X	0h	Reserved
243	X	0000h	Reserved
244-254	X	0h	Reserved
255	F	XXA5h XX is variable	Integrity word (Checksum and Signature)

■ List of Device Identification for Each Capacity

Capacity (GB)	*1 (Word 1/Word 54)	*2 (Word 57–58)	*3 (Word 60–61)	*4 (Word 100–103)
20	3FFFh	FBFC10h	2547C30h	2547C30h
40	3FFFh	FBFC10h	4A8A5B0h	4A8A5B0h
80	3FFFh	FBFC10h	950F8B0h	950F8B0h
120	3FFFh	FBFC10h	DF94BB0h	DF94BB0h
128	3FFFh	FBFC10h	EE7C2B0h	EE7C2B0h
160	3FFFh	FBFC10h	0FFFFFFFh	12A19EB0h
240	3FFFh	FBFC10h	0FFFFFFFh	1BF244B0h
256	3FFFh	FBFC10h	0FFFFFFFh	1DCF32B0h
320	3FFFh	FBFC10h	0FFFFFFFh	2542EAB0h
480	3FFFh	FBFC10h	0FFFFFFFh	37E436B0h
512	3FFFh	FBFC10h	0FFFFFFFh	3B9E12B0h
640	3FFFh	FBFC10h	0FFFFFFFh	4A8582B0h
960	3FFFh	FBFC10h	0FFFFFFFh	6FC81AB0h
1024	3FFFh	FBFC10h	0FFFFFFFh	773BD2B0h
1920	3FFFh	FBFC10h	0FFFFFFFh	DF8FE2B0h
2048	3FFFh	FBFC10h	0FFFFFFFh	EE7752B0h

## 7. ACROMYIM



The following table is to list out the acronyms that have been applied throughout the document.

Term	Definitions
AES	Advanced Encryption Standard
ATTO	Commercial performance benchmark application
CC	Conformal Coating
DEVSLP	Device Sleep Mode
DIPM	Device initiated power management
HIPM	Host initiated power management
LBA	Logical block addressing
MB	Mega-byte
MTBF	Mean time between failures
NCQ	Native command queue
PLP	Power Loss Protection
QEJ	Quick Erase Jumper
SATA	Serial advanced technology attachment
S.M.A.R.T.	Self-monitoring, analysis and reporting technology
SSD	Solid state disk
T/S	Thermal sensor
WP	Write Protection

8. PART NUMBER DECODER



SFD-2ACX<sup>1</sup>X<sup>2</sup>X<sup>3</sup>X<sup>4</sup>X<sup>5</sup>X<sup>6</sup>X<sup>7</sup>X<sup>8</sup>

Item		Series	Capacity (Byte)	NAND Flash	Option
			X <sup>1</sup> X <sup>2</sup> X <sup>3</sup> X <sup>4</sup> X <sup>5</sup>	X <sup>6</sup>	X <sup>7</sup> X <sup>8</sup>
SFD	2	AC	0020G      0120G 0040G      0240G 0080G      0480G 0160G      0960G 0320G      1920G 0640G	<b>A</b> : 3D TLC Standard (0°C to +70°C) <b>B</b> : 3D TLC Industrial (-40°C to +85°C) <b>V</b> : 3D pSLC Standard (0°C to +70°C) <b>W</b> : 3D pSLC Industrial (-40°C to +85°C)	

**X<sup>7</sup>X<sup>8</sup>**

Blank: Standard

**PA:** Power Loss Protection (PLP) + AES + T/S

**PB:** AES + T/S

**PC:** Write Protection (WP) + AES + T/S

**PD:** Quick Erase Jumper (QEJ) + AES + T/S

**PE:** Conformal Coating (CC) + AES + T/S

**PF:** CC + WP + AES + T/S

**PG:** CC + QEJ + AES + T/S

**PH:** PLP + CC + AES + T/S

**PI:** PLP + QEJ + AES + T/S

**PJ:** DEVSLP + AES + T/S

**PK:** PLP + WP + AES + T/S

**PL:** PLP + WP + CC + AES + T/S