DELKIN DEVICES®

Utility +

SATA III Industrial 2.5”

Solid State Drive

Engineering Specification

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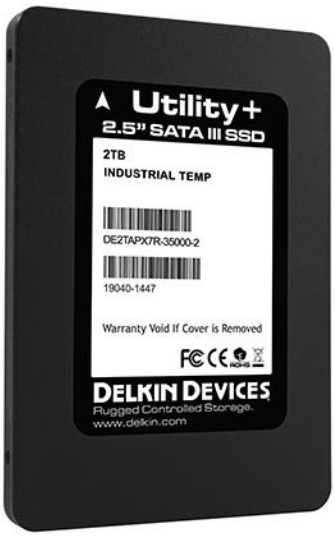

Product Overview

- **Capacity**
  - 32GB up to 4TB
- **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 520 MB/s
- **Power Consumption**[Note1]
  - Write: < 4,000mW
  - Read: < 3,200mW
  - Idle: < 1600mW
- **TBW (Terabytes Written)** [Note2]
  - 6114 TBW for 4TB (3840 GB)
- **MTBF**
  - More than 2,000,000 hours
- **Features**
  - Static and Dynamic Wear Leveling
  - Bad Block Management
  - TRIM
  - NCQ
  - SMART
  - Over-Provisioning
  - Firmware Update Capability
- **Low Power Management**
  - DIPM/HIPM Mode
- **Temperature Range**
  - Operation: -40°C ~ 85°C
  - Storage: -40°C ~ 85°C
- **RoHS compliant**
- **Support AES/TCG OPAL** [Note3]
  - 2TB and 4TB only

Notes:

1. Please see “4.2 Power Consumption” for details.
2. Please see “TBW (Terabytes Written)” in Chapter 2” for details.
3. Supported by a separate firmware version.

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1. INTRODUCTION

1.1. General Description

Delkin’s Utility+ Industrial 3D TLC 2.5” Solid State Drive (SSD) delivers all the advantages of flash disk technology with the performance of the Serial ATA III interface and is fully compliant with the standard 2.5” form factor. Delkin’s SSD draws significantly less power compared to traditional hard drives and is also hot swappable. The drive is available in capacities from 32GB to 4TB and can reach speeds up to 550MB/s read as well as 520MB/s write (measured by CrystalDiskMark v3.0).

1.2. Product Block Diagram

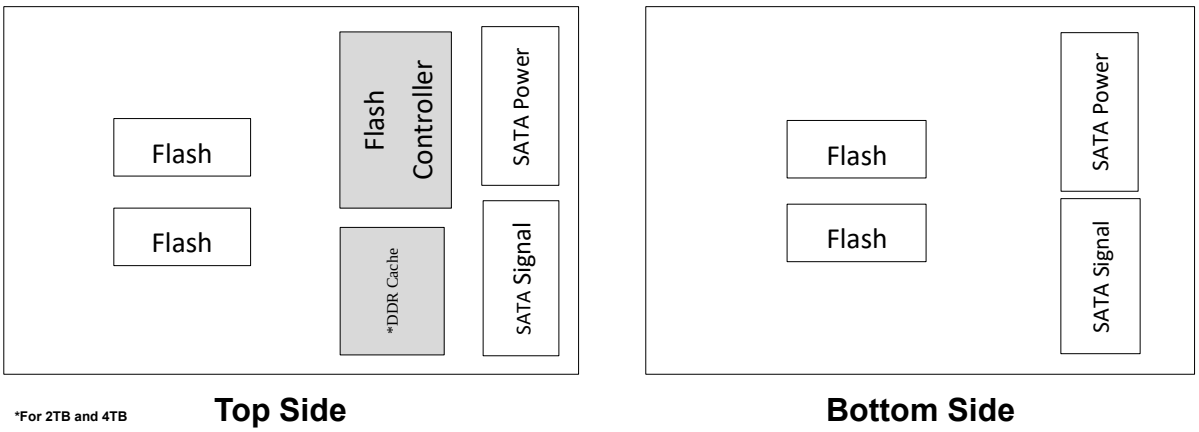

Figure 1-1 SSD Product Block Diagram

1.3. Flash Management

1.3.1. Error Correction Code (ECC)

Flash memory cells will deteriorate with use, which might generate random bit errors in the stored data. Thus, Delkin’s 2.5” SSD applies the Low Density Parity Check (LDPC) ECC algorithm, which can detect and correct errors occur during read process, ensure data been read correctly, as well as protect data from corruption.

1.3.2. Wear Leveling

NAND flash devices can only undergo a limited number of program/erase cycles, and in most cases, the flash media are not used evenly. If some areas are updated more frequently than others, the lifetime of the device would be reduced significantly. Thus, Wear Leveling is applied to extend the lifespan of NAND flash by evenly distributing write and erase cycles across the media.

Delkin utilizes advanced Wear Leveling algorithms, which can efficiently distribute flash usage through the whole flash media area. Moreover, by implementing both dynamic and static Wear Leveling algorithms, the life expectancy of the NAND flash is greatly improved.

1.3.3. Bad Block Management

Bad blocks are blocks that include one or more invalid bits, and their reliability is not guaranteed. Blocks that are identified and marked as bad by the manufacturer are referred to as “Initial Bad Blocks”. Bad blocks that are developed during usage of the flash are named “Later Bad Blocks”. Delkin implements an efficient bad block management algorithm to detect the factory-produced bad blocks and manages any bad blocks that appear with use. This practice further prevents data being stored into bad blocks and improves data reliability.

1.3.4. TRIM

TRIM is a feature which helps improve the read/write performance and speed of solid-state drives (SSD). Unlike hard disk drives (HDD), SSDs are not able to overwrite existing data, so the available space gradually becomes smaller with each use. With the TRIM command, the operating system can inform the SSD which blocks of data are no longer in use and can be removed permanently. Thus, the SSD will perform an erase action, which prevents unused data from occupying blocks.

1.3.5. SMART

SMART, an acronym for Self-Monitoring, Analysis and Reporting Technology, is an open standard that allows a drive to automatically detect its health and report potential failures. When a failure is recorded by SMART, users can choose to replace the drive to prevent unexpected outage or data loss. Moreover, SMART can inform users of impending failures while there is still time to perform proactive actions, such as copy data to another device.

1.3.6. Over-Provisioning

Over Provisioning refers to the inclusion of extra NAND capacity in a SSD, which is not visible or usable by users. With Over Provisioning, the performance and IOPS (Input/Output Operations per Second) are improved by providing the controller additional space to manage P/E cycles, which enhances the reliability and endurance as well. Moreover, the write amplification of the SSD becomes lower when the controller writes data to the flash.

1.3.7. Firmware Upgrades

Firmware can be considered as a set of instructions on how the device communicates with the host. Firmware can be upgraded when new features are added, compatibility issues are fixed, or read/write performance gets improved, as controlled by the user.

1.4. Thermal Throttling

The purpose of thermal throttling is to prevent any components in a SSD from over heating during read and write operations. The 2TB and 4TB SSD’s are designed with an on die thermal sensor, the firmware can apply different levels of throttling to achieve the purpose of protection efficiently and proactively via S M A R T reading.

1.5. Low Power Management

1.5.1. DIPM/HIPM Mode

SATA interfaces contain two low power management states for power saving: Partial and Slumber modes. In Partial mode, the device must resume full operation within 10 microseconds, whereas in Slumber mode, the device has 10 milliseconds to become fully operational. SATA interfaces allow low power modes to be initiated by Host (HIPM, Host Initiated Power Management) or Device (DIPM, Device Initiated Power Management). As for HIPM, Partial or Slumber mode can be invoked directly by the software. For DIPM, the device will send requests to enter Partial or Slumber mode.

1.6. Advanced Device Security Features

1.6.1. Secure Erase

Secure Erase is a standard ATA command and will write “0xFF” to all cells, to fully wipe all the data on hard drives and SSDs. When this command is issued, the SSD controller will erase its storage blocks and return to its factory default settings.

1.6.2. Write Protect

When a SSD contains too many bad blocks and data is continuously written in, then the SSD may no longer be usable. Thus, Write Protect is a mechanism to prevent data from being written in and protect the accuracy of data that are already stored in the SSD.

1.7. SSD Lifetime Management

1.7.1. Terabytes Written (TBW)

TBW (Terabytes Written) is a measurement of SSDs’ expected lifespan, which represents the amount of data written to the device. To calculate the TBW of a SSD, the following equation is applied:

TBW = [(NAND Endurance) x (SSD Capacity) x (WLE)] / WAF

NAND Endurance: NAND endurance refers to the P/E (Program/Erase) cycle rating of NAND flash, per the manufacturer’s specification.

SSD Capacity: The SSD capacity is the specific capacity in total of a SSD.

WLE: Wear Leveling Efficiency (WLE) represents the ratio of the average amount of erases on all the blocks to the erases on any block at maximum.

WAF: Write Amplification Factor (WAF) is a numerical value representing the ratio between the amount of data that a SSD controller writes to the flash and the amount of data that the host’s flash controller writes. A better WAF, which is near 1, guarantees better endurance and lower frequency of data written to flash memory.

1.7.2. Thermal Monitor

Thermal monitors are devices for measuring temperature, and can be found in SSDs in order to issue warnings when SSDs go beyond a certain temperature. The higher temperature the thermal monitor detects, the more power the SSD consumes, causing the SSD to age quickly. Hence, the processing speed of a SSD should be under control to prevent temperature from exceeding a certain range. Temperature can be monitored via SMART, as referenced in Section 6.3.

1.8. An Adaptive Approach to Performance Tuning

1.8.1. Throughput

Based on the available space of the disk, Delkin SSD controller will regulate the read/write speed and manage the throughput performance. When significant free space remains, the firmware will continuously perform read/write activity. At this stage, there is still no need to implement garbage collection to allocate and release memory, which will accelerate read/write processing to improve the performance. However, when free space is used up, the controller will slow down the read/write processing, and implement garbage collection to release memory blocks. Hence, read/write performance will become slower.

1.8.2. Predict & Fetch

Normally, when the host tries to read data from the SSD, the SSD will only perform one read action after receiving one command. However, Delkin’s controller applies ***Predict & Fetch*** to improve the read speed. When the host issues sequential read commands to the SSD, the SSD will automatically expect that the following will also be read commands. Thus, before receiving the next command, flash has already prepared the data. Accordingly, this accelerates the data processing time, and the host does not need to wait as long to receive data.

2. PRODUCT SPECIFICATIONS

• Capacity

- From 64GB up to 4TB

• Electrical/Physical Interface

- SATA Interface
  - Compliant with SATA Revision 3.2
  - Compatible with SATA 1.5Gbps, 3Gbps and 6Gbps interface
  - Supports power management
  - Supports expanded register for SATA protocol 48 bit addressing mode

• ECC Scheme

- SATA SSD applies the LDPC (Low Density Parity Check) of ECC algorithm

• Supports SMART and TRIM commands

• Performance and Power Consumption

Capacity	Performance		Power Consumption	
	CrystalDiskMark		Read (mW)	Write (mW)
	Read (MB/s)	Write (MB/s)		
32GB	300	125	1000	1000
64GB	550	255	1230	1020
128GB	550	450	1350	1350
256GB	550	490	1450	1450
512GB	550	490	1670	1670
1TB	550	500	1680	1680
2TB (1920GB)	550	520	3000	3200
4TB (3840GB)	550	520	3200	4000

NOTE: For more details on Power Consumption, please refer to Chapter 4.2.

• Endurance - TBW (Terabytes Written)

Capacity	TBW
32GB	17
64GB	42
128GB	75
256GB	180
512TB	425
1TB	835
2TB (1920GB)	3118
4TB (3840GB)	6114

NOTES:

1. Many factors affect drive endurance / TBW, including flash configuration, SDR configuration, host platform, usage model, write amplification factor, etc. The figures above are estimates and are not guarantees. The test followed JEDEC219A client endurance workload.

• Power on Ready Time

Specification		Power on Ready
32GB	Typ.	0.5s
64GB	Typ.	0.5s
128GB	Typ.	0.5s
256GB	Typ.	0.5s
512TB	Typ.	0.5s
1TB	Typ.	0.5s
2TB (1920GB)	Typ.	TBD
4TB (3840GB)	Typ.	TBD

Notes:

1. Maximum within 10 seconds
2. Power on ready time assumes normal power on/off.
3. The value was measured base on normal power on-off condition and would be different based on different sample status.

- **Part Numbers**

Industrial 3D TLC 2.5” SSD (-40 to 85°C Operating Temperature)

Capacity	Standard Part Number	Part Number with OPAL
32GB	DE32FQQFC-35000-2	NA
64GB	DE64FQQFC-35000-2	NA
128GB	DE1HFQQFC-35000-2	NA
256GB	DE2HFQXFC-35000-2	NA
512GB	DE5HFQXFC-35000-2	NA
1TB	DE1TFRAFC-35000-2	NA
2TB (1920GB)	DE2TFQXGJ-35000-2	TBD
4TB (3840GB)	DE4TFRAGJ-35000-2	TBD

3. ENVIRONMENTAL SPECIFICATIONS

3.1. Environmental Conditions

3.1.1. Temperature and Humidity

- Temperature:
  - Storage: -40°C to 85°C
  - Operational: -40°C to 85°C

- Humidity:
  - RH 95% under 55°C (operational)

3.1.2. Shock & Vibration

- Shock Specification
  - 1500G, 0.5ms duration

- Vibration Specification
  - 20Hz ~80Hz/1.52mm displacement, 80Hz~2000Hz / 20G Acceleration, 3 axes

3.1.3. Electrostatic Discharge (ESD)

- +/- 4KV

3.1.4. EMI Compliance

- FCC: CISPR22 (For 2TB and 4TB CESPR32)
- CE: EN55022 (For 2TB and 4TB EN55032)
- BSMI 13438

3.2. MTBF

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 units of hours. The higher the MTBF value, the higher the reliability of the device. The predicted result of Delkin’s 2.5” SSD is more than 2,000,000 hours. For 2TB and 4TB the MTBF is 1.5 million hours.

3.3. Certification & Compliance

- RoHS
- SATA III (SATA Rev. 3.2)
- Up to ATA/ATAPI-8 (Including S.M.A.R.T)
- WARNING: This product may contain chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm. For more information go to www.p65warnings.ca.gov.

4. ELECTRICAL SPECIFICATIONS

4.1. Supply Voltage

Table 4-1 Supply Voltage

Parameter	Rating
Operating Voltage	5V ± 5% (Option)
Rise Time (Max/min)	100ms / 0.1ms
Fall Time (Max/min)	5s / 1ms

4.2. Power Consumption

Table 4-2 Power Consumption

Capacity	Read	Write	Partial	Slumber	Idle
32GB	1100	1000	22.5	15.5	325
64GB	1230	1020	20	14	320
128GB	1300	1350	20	14	320
256GB	1350	1450	20	14	325
512GB	1470	1670	20	15	320
1TB	1575	1680	20	15	320
2TB (1920GB)	3000	3200	*NA	*NA	1600
4TB (3840GB)	3200	4000	*NA	*NA	1600

Unit: mW

NOTES:

1. The average value of power consumption is achieved based on 100% conversion efficiency.
2. The measured power voltage is 5V.
3. Sequential R/W is measured while testing 4000MB sequential R/W 5 times by CrystalDiskMark.
   DEVSLP is measured while entering device sleep mode for 5 minutes.
4. Power Consumption may differ according to flash configuration, SDR configuration, and host platform.

*Does not support low power mode

5. INTERFACE

5.1. Pin Assignment and Descriptions

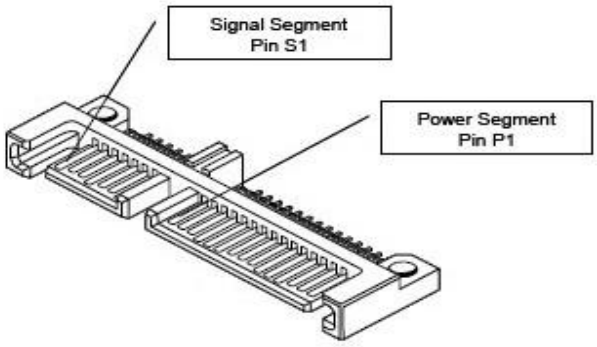

Table 5-1 Signal Segment Pin Assignment and Descriptions

PIN NUMBER	FUNCTION
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

Table 5-2 Power Segment Pin Assignment and Descriptions

PIN NUMBER	FUNCTION
P1	NOT USED (3.3V)
P2	NOT USED (3.3V)
P3	DEVSLP
P4	GND
P5	GND
P6	GND
P7	5V PRE-CHARGE
P8	5V
P9	5V
P10	GND
P11	RESERVED
P12	GND
P13	NOT USED (12V PRE-CHARGE)
P14	NOT USED (12V)
P15	NOT USED (12V)

6. SUPPORTED COMMANDS

6.1. ATA Command List

Table 6-1 ATA Command List

Op Code	Description	Op Code			Description
00h	NOP	C9h			Read DMA without Retry
06h	Data Set Management	CAh			Write DMA
10h-1Fh	Recalibrate	CBh			Write DMA without Retry
20h	Read Sectors	CEh			Write Multiple FUA EXT
21h	Read Sectors without Retry	E0h			Standby Immediate
24h	Read Sectors EXT	E1h			Idle Immediate
25h	Read DMA EXT	E2h			Standby
27h	Read Native Max Address EXT	E3h			Idle
29h	Read Multiple EXT	E4h			Read Buffer
2Fh	Read Log EXT	E5h			Check Power Mode
30h	Write Sectors	E6h			Sleep
31h	Write Sectors without Retry	E7h			Flush Cache
34h	Write Sectors EXT	E8h			Write Buffer
35h	Write DMA EXT	E9h			READ BUFFER DMA
37h	Set Native Max Address EXT	EAh			Flush Cache EXT
38h	CFA WRITE SECTORS WITHOUT ERASE	EBh			Write Buffer DMA
39h	Write Multiple EXT	ECh			Identity Device
3Dh	Write DMA FUA EXT	EFh			Set Features
3Fh	Write Long EXT	EFh	02h		Enable volatile write cache
40h	Read Verify Sectors	EFh	03h		Set Transfer mode
41h	Read Verify Sectors without Retry	EFh	05h		Enable the APM feature set
42h	Read Verify Sectors EXT	EFh	10h		Enable use of SATA features set
44h	Zero EXT	EFh	10h	02h	Enable DMA Setup FIS Auto-Activate optimization
45h	WRITE UNCORRECTABLE EXT	EFh	10h	03h	Enable Device-initiated interface power state (DIPM) transitions
47h	Red Log DMA EXT	EFh	10h	06h	Enable Software Settings Preservation (SSP)
57h	Write Log DMA EXT	EFh	10h	07h	Enable Device Automatic Partial to Slumber transitions
60h	Read FPDMA Queued	EFh	10h	09h	Enable Device Sleep

61h		Write FPDMA Queued	EFh	55h		Disable read look-ahead
70h-7Fh		Seek	EFh	66h		Disable reverting to power-on defaults
90h		Execute Device Diagnostic	EFh	82h		Disable volatile write cache
91h		Initialize Device Parameters	EFh	85h		Disable the APM feature set
92h		Download Microcode	EFh	90h		Disable use of SATA feature set
93h		DOWNLOAD MICROCODE DMA	EFh	90h	02h	Disable DMA Setup FIS Auto-Activate optimization
B0h		SMART	EFh	90h	03h	Disable Device-initiated interface power state (DIPM) transitions
B0h	D0h	SMART READ DATA	EFh	90h	06h	Disable Software Settings Preservation (SSP)
B0h	D1h	SMART READ ATTRIBUTE THRESHOLDS	EFh	90h	07h	Disable Device Automatic Partial to Slumber transitions
B0h	D2h	SMART ENABLE/DISABILE ATTRIBUTE AUTOSAVE	EFh	90h	09h	Disable Device Sleep
B0h	D3h	SMART SAVE ATTRIBUTE VALUES	EFh	AAh		Enable read look-ahead
B0h	D4h	SMART EXECUTE OFF-LINE IMMEDIATE	EFh	CCh		Enable reverting to power-on defaults
B0h	D5h	SMART READ LOG	F1h			Security Set Password
B0h	D6h	SMART WRITE LOG	F2h			Security Unlock
B0h	D8h	SMART ENABLE OPERATIONS	F3h			Security Erase Prepare
B0h	D9h	SMART DISABLE OPERATIONS	F4h			Security Erase Unit
B0h	DAh	SMART RETURN STATUS	F5h			Security Freeze Lock
B0h	DBh	SMART ENABLE/DISABILE AUTOMATIC OFF-LINE	F6h			Security Disable Password
B1h		Device Configuration	F8h			Read Native Max Address
B4h		Sanitize	F9h			Set Max Address
C4h		Read Multiple	F9h	01h		SET MAX SET PASSWORD
C5h		Write Multiple	F9h	02h		SET MAXLOCK
C6h		Set Multiple Mode	F9h	03h		SET MAX UNLOCK
C8h		Read DMA	F9h	04h		SET MAX FREEZE LOCIK

6.2. Identify Device Data

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

Table 6-2 List of Device Identification

Word	F: Fixed V: Variable X: Both	Default Value	Description
0	F	0040h	General configuration bit-significant information
1	X	***1**	Obsolete
2	V	C837h	Specific configuration
3	X	0010h	Obsolete
4-5	X	00000000h	Retired
6	X	003Fh	Obsolete
7-8	V	00000000h	Reserved for assignment by the Compact Flash Association
9	X	0000h	Retired
10-19	F	Varies	Serial number (20 ASCII characters)
20-21	X	0000h	Retired
22	X	0000h	Obsolete
23-26	F	Varies	Firmware revision (8 ASCII characters)
27-46	F	Varies	Model number (xxxxxxxx)
47	F	8010h	7:0- Maximum number of sectors transferred per interrupt on MULTIPLE commands
48	F	4000h	Trusted Computing feature set options (not support)
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
55	X	0010h	Obsolete
56	X	003Fh	Obsolete
57-58	X	***2**	Obsolete
59	F	0110h	Sanitize and Number of sectors transferred per interrupt on MULTIPLE commands
60-61	F	***3**	Maximum number of sector (28bit LBA mode)
62	X	0000h	Obsolete
63	F	0407h	Multi-word DMA modes supported/selected
64	F	0003h	PIO modes supported
65	F	0078h	Minimum Multiword DMA transfer cycle time per word

Word	F: Fixed V: Variable X: Both	Default Value	Description
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	0100h	Additional Supported (support download microcode DMA)
70	F	0000h	Reserved
71-74	F	0000000000000000h	Reserved for the IDENTIFY PACKET DEVICE command
75	F	001Fh	Queue depth
76	F	670eh	Serial SATA capabilities
77	F	0084h	Serial ATA Additional Capabilities
78	F	014Ch	Serial ATA features supported
79	V	0040h	Serial ATA features enabled
80	F	07F8h	Major Version Number
81	F	0000h	Minor Version Number
82	F	346bh	Command set supported
83	F	7d09h	Command set supported
84	F	6063h	Command set/feature supported extension
85	V	3469h	Command set/feature enabled
86	V	bc01h	Command set/feature enabled
87	V	6063h	Command set/feature default
88	V	003Fh	Ultra DMA Modes
89	F	0001h	Time required for security erase unit completion
90	F	001Eh	Time required for Enhanced security erase completion
91	V	0000h	Current advanced power management value
92	V	FFFEh	Master Password Revision Code
93	F	0000h	Hardware reset result. For SATA devices, word 93 shall be set to the value 0000h.
94	X	0000h	Obsolete
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	V	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	World Wide Name
112-115	F	0000000000000000h	Reserved
116	V	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	F	0h	Reserved
127	F	0000h	Obsolete
128	V	0021h	Security status
129-140	V	Varies	Vendor specific
141	V	Varies	Vendor specific
142-159	X	Varies	Vendor specific
160	F	0h	Reserved for assignment by the CFA
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	000000000000 000 0h	Additional Product Identifier
174-175	X	0h	Reserved
176-205	V	0h	Current media serial number
206	F	000h	SCT Command Transport
207-208	F	00000000h	Reserved
209	F	4000h	Alignment of logical blocks within a physical block
210-211	V	00000000h	Write-Read-Verify Sector Count Mode 3 (not supported)
212-213	F	00000000h	Write-Read-Verify Sector Count Mode 2 (not supported)
214-216	X	0h	Obsolete
217	F	0001h	Non-rotating media device
218	X	000h	Reserved
219	X	0000h	NV Cache relate (not supported)
220	V	0000h	Write read verify feature set current mode
221		0000h	Reserved
222	F	10FFh	Transport major version number
223	F	0000h	Transport minor version number
224-229	X	0h	reserved
230-233	F	0000000000000000h	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
236-254	F	0h	Reserved
255	X	XXA5h XX is variable	Integrity word (Checksum and Signature)

Table 6-3 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)
32	3FFFh	FBFC10h	3BA2EB0h	3BA2EB0h
64	3FFFh	FBFC10h	7740AB0h	7740AB0h
128	3FFFh	FBFC10h	EE7C2B0h	EE7C2B0h
256	3FFFh	FBFC10h	FFFFFFFh	1DCF32B0h
512	3FFFh	FBFC10h	FFFFFFFh	3B9E12B0h
1024	3FFFh	FBFC10h	FFFFFFFh	773BD2B0h
1920	3FFFh	FBFC10h	FFFFFFFh	DF8FE2B0h
3840	3FFFh	FBFC10h	FFFFFFFh	1BF1F72B0h

7. PHYSICAL DIMENSIONS

Dimension: 100.00mm (L) x 69.85mm (W) x 7mm (H)