DELKIN DEVICES®

# Utility

## SATA III mSATA

## Solid State Drive

## Engineering Specification

**Document Number: 401-0452-00**

**Revision: B**

# Product Overview

- **Capacity**
  - 32GB up to 1TB
- **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**[Note1]
  - Active mode: < 2,000mW
  - Idle mode: < 325mW
- **MTBF**
  - More than 2,000,000 hours
- **Features**
  - Static and Dynamic Wear Leveling
  - Bad Block Management
  - TRIM
  - SMART
  - Over-Provisioning
  - Firmware Update
- **Low Power Management**
  - DEVSLP Mode (Optional)
  - DIPM/HIPM Mode
- **Temperature Range**
  - Operation: -0°C ~ 70°C
  - Storage: -40°C ~ 85°C
- **RoHS compliant**

**Notes:**

1. Please see “4.2 Power Consumption” for details.

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# 1. INTRODUCTION

## 1.1. General Description

Delkin's Utility mSATA Solid State Drive (SSD) delivers all the advantages of flash disk technology with Serial ATA I/II/III interface and is fully compliant with the JEDEC MO-300B form factor standard. The mSATA draws significantly lower power compared to traditional hard drives. The drive is available in capacities from 32GB to 1TB and can reach speeds up to 550MB/s read as well as 500MB/s write (measured by CrystalDiskMark v5.0).

## 1.2. Product Block Diagram

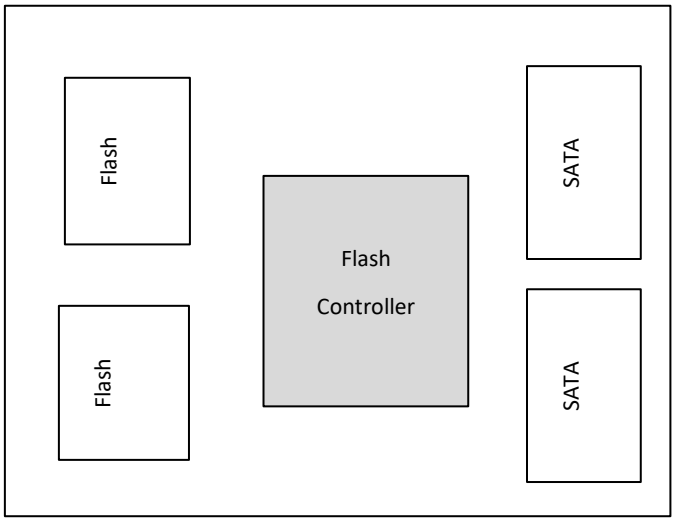


**Figure 1-1 mSATA SSD Product Block Diagram**

## 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 Utility mSATA SSD applies the LDPC (Low Density Parity Check) 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. Low Power Management

### 1.4.1. DEVSLP Mode (Optional)

With the increasing need of aggressive power/battery life, SATA interfaces include a new feature, Device Sleep (DEVSLP) mode, which helps further reduce the power consumption of the device. DEVSLP enables the device to completely power down the device PHY and other sub-systems, making the device reach a new level of lower power operation. The DEVSLP does not specify the exact power level a device can achieve in the DEVSLP mode, but the power usage can be dropped down to 5mW or less.

### 1.4.2. 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.

## 1.5. Power Loss Protection: Flushing Mechanism

Power Loss Protection is a mechanism to prevent data loss during unexpected power failures. DRAM is volatile memory and frequently used as temporary cache or buffer between the controller and the NAND flash to improve SSD performance. However, one major concern of the DRAM is that data could be lost in the event of a power failure. Accordingly, the Delkin SATA controller applies the ***GuaranteedFlush*** technology, which requests the controller to transfer data to the cache. Only when the data is fully committed to the NAND flash will the controller send acknowledgement (ACK) to the host. Such implementation can prevent false-positive performance and the risk of power cycling issues.

Additionally, it is critical for a controller to shorten the time the in-flight data stays in the cache. Thus, Delkin’s controller applies an algorithm to reduce the amount of data residing in the cache to provide

better performance. This ***SmartCacheFlush*** technology allows incoming data to have only a brief "pit stop" in the cache and then move straight to the NAND flash. If the flash is jammed due to particular file sizes (such as random 4KB data), the cache will be treated as an "organizer", consolidating incoming data into groups before written into the flash to improve write amplification.
In summary, with this advanced Flush Mechanism, Delkin's controller provides the reliability and data protection required by today's applications and hosts.

## 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. Thermal Monitor (Optional)

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 the temperature the thermal monitor detects, the more power the SSD consumes, causing the SSD to age quickly. Therefore, the processing speed of the SSD will be under control to prevent the temperature from exceeding a certain range.

## 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 32GB up to 1TB

- ## 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

  mSATA applies the LDPC (Low Density Parity Check) ECC algorithm.

- ## Supports SMART and TRIM commands

- ## Performance and Power Consumption

| Capacity | Performance | | Power Consumption | | |
|---|---|---|---|---|---|
| | CrystalDiskMark | | Read (mW) | Write (mW) | IDLE (mW) |
| | Read (MB/s) | Write (MB/s) | | | |
| 32GB | 300 | 125 | 950 | 850 | 300 |
| 64GB | 550 | 255 | 1,215 | 1,020 | 300 |
| 128GB | 550 | 275 | 1,250 | 1,210 | 315 |
| 256GB | 550 | 490 | 1,350 | 1,400 | 300 |
| 512GB | 550 | 490 | 1,360 | 1,450 | 320 |
| 1TB | 550 | 500 | 1,575 | 1,620 | 325 |

**NOTE:**

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

- **Part Numbers**

## 3D TLC mSATA (0 to 70°C Operating Temperature)

| Capacity | Part Number |
|---|---|
| 32GB | MD32FNUFC-3N000-2 |
| 64GB | MD64FNUFC-3N000-2 |
| 128GB | MD1HFNWFC-3N000-2 |
| 256GB | MD2HFLGFC-3N000-2 |
| 512GB | MD5HFLGFC-3N000-2 |
| 1TB | MD1TFNXFC-3N000-2 |

# 3. ENVIRONMENTAL SPECIFICATIONS

## 3.1. Environmental Conditions

### 3.1.1. Temperature and Humidity

- Temperature:
  - Storage: -40°C to 85°C
  - Operational: 0°C to 70°C

- Humidity:
  - RH 90% under 40°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 contact

### 3.1.4. EMI Compliance

- FCC: CISPR22
- CE: EN55022
- 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 mSATA SSD is more than 2,000,000 hours.

## 3.3. Certification & Compliance

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

# 4. ELECTRICAL SPECIFICATIONS

## 4.1. Supply Voltage

**Table 4-1 Supply Voltage**

| Parameter | Rating |
|---|---|
| Operating Voltage | 3.3V |

## 4.2. Power Consumption

**Table 4-2 Power Consumption**

| Capacity | Read | Write | Partial | Slumber | Idle |
|---|---|---|---|---|---|
| 32GB | 950 | 850 | 15 | 10 | 300 |
| 64GB | 1,215 | 1,020 | 15 | 10 | 300 |
| 128GB | 1,250 | 1,210 | 20 | 12 | 315 |
| 256GB | 1,350 | 1,400 | 15 | 10 | 300 |
| 512GB | 1,360 | 1,450 | 22 | 16 | 320 |
| 1TB | 1,575 | 1,620 | 22 | 15 | 325 |

Unit: mW

**NOTES:**

1. The average value of power consumption is achieved based on 100% conversion efficiency.
2. The measured input power voltage is 3.3V.
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 and host platform.

 

# 5. INTERFACE

## 5.1. Pin Assignment and Descriptions

**Table 5-1 Pin Assignment and Description for mSATA**

| Pin Number | mSATA Pin | Description |
|---|---|---|
| 1 | NC | No Connect |
| 2 | +3.3V | 3.3V Source |
| 3 | NC | No Connect |
| 4 | DGND | Digital GND |
| 5 | NC | No Connect |
| 6 | NC | No Connect |
| 7 | NC | No Connect |
| 8 | NC | No Connect |
| 9 | DGND | Digital GND |
| 10 | NC | No Connect |
| 11 | NC | No Connect |
| 12 | NC | No Connect |
| 13 | NC | No Connect |
| 14 | NC | No Connect |
| 15 | DGND | Digital GND |
| 16 | NC | No Connect |
| 17 | NC | No Connect |
| 18 | DGND | Digital GND |
| 19 | NC | No Connect |
| 20 | NC | No Connect |
| 21 | SATA GND | SATA Ground Return Pin |
| 22 | NC | No Connect |
| 23 | TXP (out) | Host Receiver Differential Signal Pair |
| 24 | +3.3V | 3.3V Source |
| 25 | TXN (out) | Host Receiver Differential Signal Pair |
| 26 | SATA GND | SATA Ground Return Pin |
| 27 | SATA GND | SATA Ground Return Pin |
| 28 | NC | No Connect |
| 29 | SATA GND | SATA Ground Return Pin |
| 30 | NC | No Connect |
| 31 | RXN (in) | Host Transmitter Differential Signal Pair |
| 32 | NC | No Connect |

| | | |
|---|---|---|
| 33 | RXP (in) | Host Transmitter Differential Signal Pair |
| 34 | DGND | Digital GND |
| 35 | SATA GND | SATA Ground Return Pin |
| 36 | NC | No Connect |
| 37 | SATA GND | SATA Ground Return Pin |
| 38 | NC | No Connect |
| 39 | +3.3V | 3.3V Source |
| 40 | DGND | Digital GND |
| 41 | +3.3V | 3.3V Source |
| 42 | NC | No Connect |
| 43 | NC | No Connect |
| 44 | DEVSLP | Enter/Exit DevSleep |
| 45 | NC | Reserved Pin |
| 46 | NC | No Connect |
| 47 | NC | Reserved Pin |
| 48 | NC | No Connect |
| 49 | DAS | Device Activity Signal |
| 50 | DGND | Digital GND |
| 51 | GND | Default Connect to GND |
| 52 | +3.3V | 3.3V Source |

# 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<br>V: Variable<br>X: Both | Default Value | Description |
|---|---|---|---|
| 0 | F | 0040h | General configuration bit-significant information |
| 1 | X | ***1** | Obsolete – Number of logical cylinders |
| 2 | V | 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 | 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 |
| 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 – 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 | 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<br>V: Variable<br>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 | V | 0000h | Obsolete |
| 95 | F | 0000h | Stream Minimum Request Size |
| 96 | V | 0000h | Streaming Transfer Time – DMA |
| 97 | V | 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 |

| Word | F: Fixed<br>V: Variable<br>X: Both | Default Value | Description |
|---|---|---|---|
| 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 | 0000000000000000h | Unique ID |
| 112-115 | F | 0000000000000000h | Reserved |
| 116 | V | 0000h | Reserved |
| 117-118 | F | 00000000h | Words per logical Sector |
| 119 | F | 4014h | Supported settings |
| 120 | F | 4014h | Command set/Feature Enabled/Supported |
| 121-126 | F | 0h | Reserved |
| 127 | F | 0000h | Removable Media Status Notification feature set support |
| 128 | V | 0021h | Security status |
| 129-140 | X | Varies | Vendor specific |
| 141 | X | Varies | Vendor specific |
| 142-159 | X | Varies | Vendor specific |
| 160 | F | 0000h | Compact Flash Association (CFA) power mode 1 |
| 161-167 | X | 0h | Reserved for assignment by the CFA |
| 168 | F | Varies | Device Nominal Form Factor |
| 169 | F | 0001h | DATA SET MANAGEMENT command is supported |
| 170-173 | F | 0000000000000000h | Additional Product Identifier |
| 174-175 | X | 00000000h | Reserved |
| 176-205 | F | 0h | Current media serial number |
| 206 | F | 0000h | SCT Command Transport |
| 207-208 | X | 00000000h | Reserved |
| 209 | F | 4000h | Alignment of logical blocks within a physical block |
| 210-211 | F | 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 | | 00h | NV Cache relate (not supported) |
| 217 | F | 0001h | Non-rotating media device |
| 218 | F | 0000h | Reserved |
| 219 | F | 0000h | NV Cache relate (not supported) |
| 220 | V | 0000h | Write read verify feature set current mode |

| Word | F: Fixed<br>V: Variable<br>X: Both | Default Value | Description |
|---|---|---|---|
| 221 | X | 0000h | Reserved |
| 222 | F | 107Fh | 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 | 0080h | Maximum number of 512-byte data blocks per DOWNLOAD MICROCODE command for mode 03h |
| 236-254 | X | 0h | Reserved |
| 255 | F | XXA5h<br>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 |

# 7. PHYSICAL DIMENSIONS

**Dimension: 50.8 ±0.15mm (L) x 29.85 ±0.15mm (W) x 4.00mm (H)**