# M500DC 2.5-Inch TCG Enterprise SATA NAND Flash SSD

## MTFDDAK120MBB-1AE16ABYY, MTFDDAK240MBB-1AE16ABYY, MTFDDAK480MBB-1AE16ABYY, MTFDDAK800MBB-1AE16ABYY

## Features

- Micron® 20nm MLC NAND Flash
- SATA 6 Gb/s interface
- TCG Enterprise Ver 1.0 Final Rev 3.0 compliant self-encrypting drive (SED)
- ATA modes supported
  - PIO mode 3, 4
  - Multiword DMA mode 0, 1, 2
  - Ultra DMA mode 0, 1, 2, 3, 4, 5, 6
- 512-byte sector size support
- Native command queuing support with 32-command slot support
- ATA-8 ACS2 command set compliant
- ATA security feature command set and password login support
- Security erase command set: fast and secure erase
- 120GB performance (steady state) [1, 2]
  - Sequential 128KB read: 425 MB/s
  - Sequential 128KB write: 200 MB/s
  - Random 4KB read: 63,000 IOPS
  - Random 4KB write: 23,000 IOPS
  - READ/WRITE latency: 0.50ms/1.5ms (TYP)
- 240GB performance (steady state) [1, 2]
  - Sequential 128KB read: 425 MB/s
  - Sequential 128KB write: 330 MB/s
  - Random 4KB read: 63,000 IOPS
  - Random 4KB write: 33,000 IOPS
  - READ/WRITE latency: 0.50ms/1.5ms (TYP)
- 480GB performance (steady state) [1, 2]
  - Sequential 128KB read: 425 MB/s
  - Sequential 128KB write: 375 MB/s
  - Random 4KB read: 63,000 IOPS
  - Random 4KB write: 35,000 IOPS
  - READ/WRITE latency: 0.50ms/1.5ms (TYP)
- 800GB performance (steady state) [1, 2]
  - Sequential 128KB read: 425 MB/s
  - Sequential 128KB write: 375 MB/s
  - Random 4KB read: 65,000 IOPS
  - Random 4KB write: 24,000 IOPS
  - READ/WRITE latency: 0.50ms/1.5ms (TYP)
- Reliability
  - MTTF: 2 million device hours[3]
  - Static and dynamic wear leveling
  - Uncorrectable bit error rate (UBER): <1 sector per $10^{16}$ bits read
  - End-to-end data protection
  - Enhanced power-loss data protection with data protection capacitor monitoring
- Self-monitoring, analysis, and reporting technology (SMART) command set
- Hot-plug capable
- Endurance: Total bytes written (TBW)
  - 120GB: 0.5PB; 240GB: 1.0PB; 480GB: 1.9PB; 800GB: 1.9PB
- Capacity[4] (unformatted): 120GB, 240GB, 480GB, 800GB
- Mechanical: 7.0mm height
  - SATA connector: 5V ±10%
  - 2.5-inch drive: 100.45mm x 69.85mm x 7.0mm
  - Conforms to SFF standards
- RoHS-compliant package
- Field-upgradeable firmware
- Power consumption: <6.0W (TYP); <6.3W (TYP) for 800GB
- Operating temperature
  - Commercial (0°C to 70°C)[5]

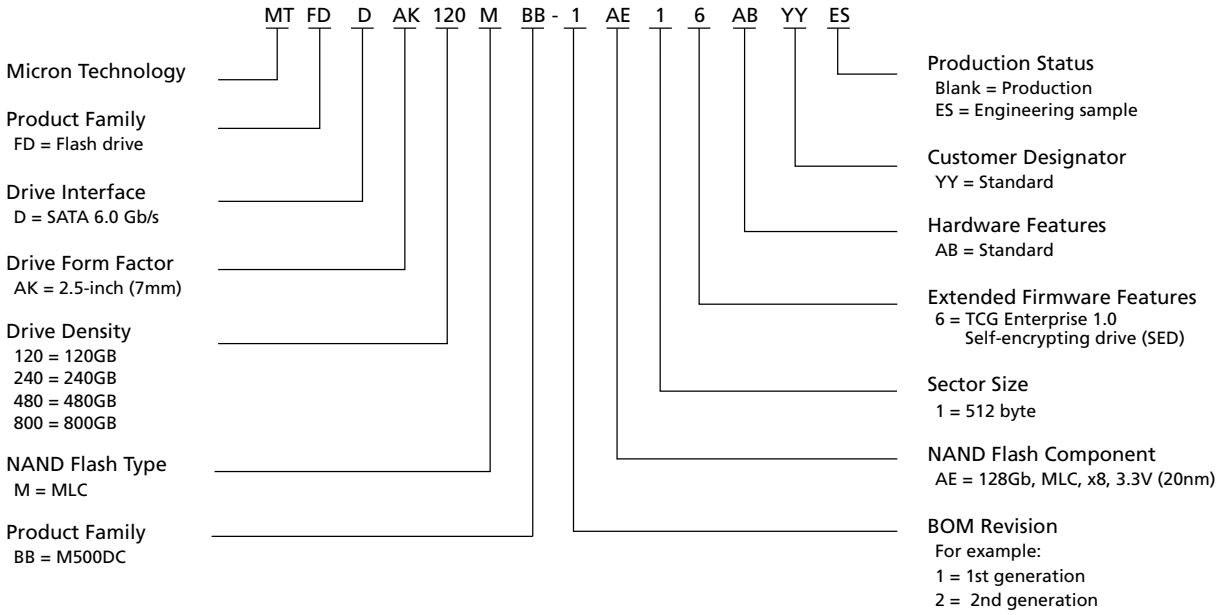
Notes:
1. Typical I/O performance numbers as measured using Iometer with a queue depth of 32 and write cache disabled.
2. 4KB transfers used for READ/WRITE latency values.
3. The product achieves a MTTF based on population statistics not relevant to individual units.
4. 1GB = 1 billion bytes; formatted capacity is less.
5. Drive case temperature.

**Warranty**: Contact your Micron sales representative for further information regarding the product, including product warranties.

## Part Numbering Information

Micron's M500DC SSD is available in different configurations and densities. Visit micron.com for a list of valid part numbers.

### Figure 1: Part Number Chart

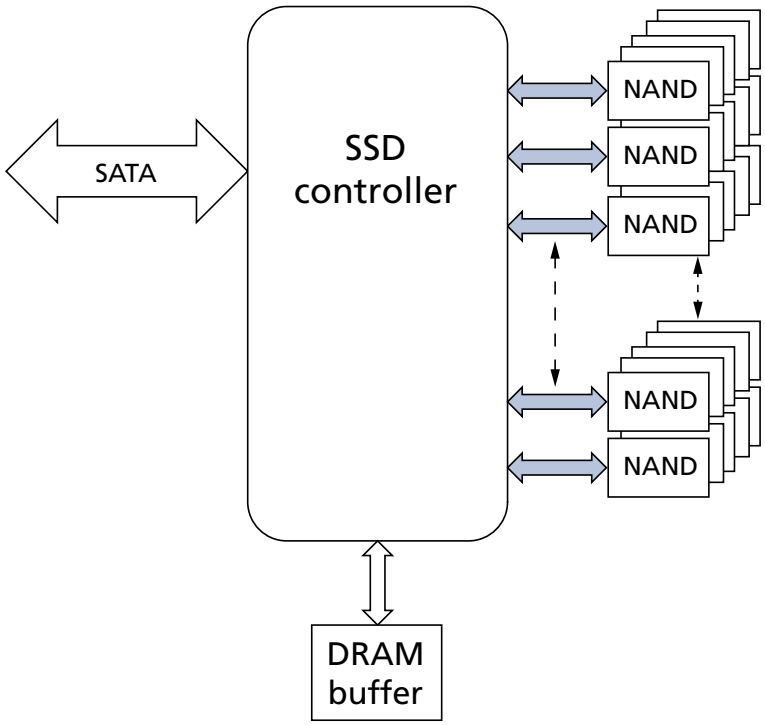


# General Description

Micron's M500DC solid state drive (SSD) uses a single-chip controller with a SATA interface on the system side and n-channels of Micron NAND Flash internally. Packaged in an HDD replacement enclosure, the SSD integrates easily in existing storage infrastructures.

The M500 DC is designed to support and manage the needs of enterprise platforms that utilize high IOPs traffic previously supported solely by SLC solutions, it provides the performance, endurance, and data integrity required by these growing environments.

**Figure 2: Functional Block Diagram**



# Logical Block Address Configuration

The drive is set to report the number of logical block addresses (LBA) that will ensure sufficient storage space for the specified density. Standard LBA settings, based on the IDEMA standard (LBA1-02), are shown below.

**Table 1: Standard LBA Settings – 512-Byte Sector Size**

| | Total LBA | | Max LBA | | User Available Bytes |
|---|---|---|---|---|---|
| Drive Size | Decimal | Hexadecimal | Decimal | Hexadecimal | (Unformatted) |
| 120GB | 234,441,648 | DF94BB0 | 234,441,647 | DF94BAF | 120,034,123,776 |
| 240GB | 468,862,128 | 1BF244B0 | 468,862,127 | 1BF244AF | 240,057,409,536 |
| 480GB | 937,703,088 | 37E436B0 | 937,703,087 | 37E436AF | 480,103,981,056 |
| 800GB | 1,562,824,368 | 5D26CEB0 | 1,562,824,367 | 5D26CEAF | 800,166,076,416 |

# Interface Connectors

The SATA signal segment interface cable has four conductors and three ground connections. As shown in Package Dimensions, the cable includes a 7-pin signal segment and a 15-pin power segment arranged in a single row with a 1.27mm (0.050in) pitch.

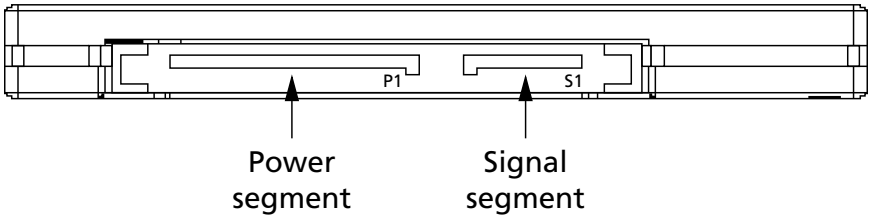
**Table 2: SATA Signal Segment Pin Assignments**

| Signal Name | Type | Description |
|---|---|---|
| S1 | GND | Ground |
| S2 | A | Differential signal pair A and A# |
| S3 | A# | |
| S4 | GND | Ground |
| S5 | B# | Differential signal pair B and B# |
| S6 | B | |
| S7 | GND | Ground |

**Table 3: 2.5-Inch SATA Power Segment Pin Assignments**

| Pin# | Signal Name | Description |
|---|---|---|
| P1 | V33 | No connect |
| P2 | V33 | No connect |
| P3 | V33 | No connect |
| P4 | GND | Ground |
| P5 | GND | Ground |
| P6 | GND | Ground |
| P7 | V5 | 5V power, precharge |
| P8 | V5 | 5V power |
| P9 | V5 | 5V power |
| P10 | GND | Ground |
| P11 | DAS | Device activity signal |
| P12 | GND | Ground |
| P13 | V12 | No connect |
| P14 | V12 | No connect |
| P15 | V12 | No connect |

**Figure 3: SSD Interface Connections**




# Device ID

### Table 4: Identify Device

See Note 1 for setting definitions

| Word | Bit(s) | Setting | Default Value | Description |
|---|---|---|---|---|
| 0 | – | – | – | General configuration bit-significant information |
| | 15 | F | 0b | 0 = ATA device |
| | 14–8 | X | 0000100 | Retired |
| | 7 | F | 0b | 1 = Removable media device |
| | 6 | F | 1b | Obsolete |
| | 5–3 | X | 000b | Retired |
| | 2 | V | 0b | Response incomplete |
| | 1 | X | 0b | Retired |
| | 0 | F | 0b | Reserved |
| 1 | – | – | 3FFFh | Obsolete |
| 2 | – | F | C837h | Specific configuration |
| 3 | – | F | 0010h | Obsolete |
| 4 | – | F | 0000h 0000h | Retired |
| 6 | – | F | 003Fh | Obsolete |
| 7 | – | (O)V | 0000h 0000h | Reserved for assignment by the CompactFlash™ Association |
| 9 | – | ( )X | 0000h | Retired |
| 10 | – | (M)F | Varies | Serial number (20 ASCII characters) |
| 20 | – | ( )X | 0000h 0000h 0000h | Retired/obsolete |
| 23 | – | (M)F | Varies | Firmware revision (8 ASCII characters) |
| 27 | – | (M)F | Varies | Model number (40 ASCII characters) |
| 47 | 15–8 | F | 80h | 80h |
| | 7–0 | F | 10h | 00h = Reserved<br>01h-FFh = Maximum number of logical sectors that shall be transferred per DRQ data block on READ/WRITE MULTIPLE commands |

**Table 4: Identify Device (Continued)**

See Note 1 for setting definitions

| Word | Bit(s) | Setting | Default Value | Description |
|---|---|---|---|---|
| 48 | – | – | – | Trusted Computing feature set options |
| | 15 | F | 0b | Shall be cleared to zero |
| | 14 | F | 1b | Shall be set to one |
| | 13–1 | F | 0000000000000b | Reserved for the Trusted Computing Group |
| | 0 | F | 1b | 1 = Trusted Computing feature set is supported |
| 49 | – | – | – | Capabilities |
| | 15–14 | F | 00b | Reserved for the IDENTIFY PACKET DEVICE command |
| | 13 | F | 1b | 1 = Standby timer values as specified in this standard are supported<br>0 = Standby timer values shall be managed by the device |
| | 12 | F | 0b | Reserved for the IDENTIFY PACKET DEVICE command |
| | 11 | F | 1b | 1 = IORDY is supported<br>0 = IORDY may be supported |
| | 10 | F | 1b | 1 = IORDY may be disabled |
| | 9 | – | 1b | 1 = LBA is supported |
| | 8 | F | 1b | 1 = DMA is supported |
| | 7–0 | F | 00000000b | Retired |
| 50 | – | – | – | Capabilities |
| | 15 | F | 0b | Shall be cleared to zero |
| | 14 | F | 1b | Shall be set to one |
| | 13–2 | F | 000000000000b | Reserved |
| | 1 | X | 0b | Obsolete |
| | 0 | F | 1b | Shall be set to one to indicate a vendor-specific standby timer value minimum |
| 51 | – | ( )X | 0000h 0000h | Obsolete |
| 53 | 15–3 | F | 0000000000000b | Reserved |
| | 2 | F | 1b | 1 = The fields reported in word 88 are valid<br>0 = The fields reported in word 88 are not valid |
| | 1 | F | 1b | 1 = The fields reported in words (70:64) are valid<br>0 = the fields reported in words (70:64) are not valid |
| | 0 | X | 1b | Obsolete |
| 54 | – | ( )X | 3FFFh 0010h<br>003Fh FC10h<br>00FBh | Obsolete |

**Table 4: Identify Device (Continued)**

See Note 1 for setting definitions

| Word | Bit(s) | Setting | Default Value | Description |
|---|---|---|---|---|
| 59 | 15 | F | 1b | 1 = The BLOCK ERASE EXT command is supported |
| | 14 | F | 1b | 1 = The OVERWRITE EXT command is supported |
| | 13 | F | 1b | 1 = The CRYPTO SCRAMBLE EXT command is supported |
| | 12 | V | 1b | 1 = The sanitize feature set is supported,<br>Default = 1, 0 when TCG enabled |
| | 11–9 | F | 000b | Reserved |
| | 8 | V | 1b | 1 = Multiple sector settings are valid |
| | 7–0 | V | 00010000b | xxh = Current setting for number of logical sectors that shall be transferred per DRQ data block on READ/WRITE MULTIPLE commands |
| 60 | – | M(F) | Varies by capacity | Total number of user addressable logical sectors |
| 62 | – | ( )X | 0000h | Obsolete |
| 63 | 15–11 | F | 00000b | Reserved |
| | 10 | V | 0b | 1 = Multiword DMA mode 2 is selected<br>0 = Multiword DMA mode 2 is not selected |
| | 9 | V | 0b | 1 = Multiword DMA mode 1 is selected<br>0 = Multiword DMA mode 1 is not selected |
| | 8 | V | 0b | 1 = Multiword DMA mode 0 is selected<br>0 = Multiword DMA mode 0 is not selected |
| | 7–3 | F | 0000b | Reserved |
| | 2 | F | 1b | 1 = Multiword DMA mode 2 and below are supported |
| | 1 | F | 1b | 1 = Multiword DMA mode 1 and below are supported |
| | 0 | F | 1b | 1 = Multiword DMA mode 0 is supported |
| 64 | 15–8 | F | 00h | Reserved |
| | 7–0 | F | 03h | PIO modes is supported |
| 65 | – | F | 0078h | Minimum Multiword DMA transfer cycle time per word<br>Cycle time in nanoseconds |
| 66 | – | F | 0078h | Manufacturer's recommended Multiword DMA transfer cycle time<br>Cycle time in nanoseconds |
| 67 | – | F | 0078h | Minimum PIO transfer cycle time without flow control<br>Cycle time in nanoseconds |
| 68 | – | F | 0078h | Minimum PIO transfer cycle time with IORDY flow control<br>Cycle time in nanoseconds |

**Table 4: Identify Device (Continued)**

See Note 1 for setting definitions

| Word | Bit(s) | Setting | Default Value | Description |
|---|---|---|---|---|
| 69 | – | F | – | Additional supported |
| | 15 | F | 0b | 1 = CFast specification is supported |
| | 14 | F | 1b | 1 = Deterministic read after trim is supported |
| | 13 | F | 0b | 1 = Long physical sector alignment error reporting control is supported |
| | 12 | F | 0b | 1 = DEVICE CONFIGURATION IDENTIFY DMA and DEVICE CONFIGURATION SET DMA are supported |
| | 11 | F | 0b | 1 = READ BUFFER DMA is supported |
| | 10 | F | 0b | 1 = WRITE BUFFER DMA is supported |
| | 9 | F | 1b | 1 = SET MAX PASSWORD DMA and SET MAX UNLOCK DMA are supported |
| | 8 | F | 0b | 1 = DOWNLOAD MICROCODE DMA is supported |
| | 7 | F | 0b | Reserved for IEEE-1667 |
| | 6 | F | 0b | 1 = Optional ATA device 28-bit commands are supported |
| | 5 | F | 1b | 1 = Read zero after trim is supported |
| | 4 | F | 1b | 1 = Device encrypts all user data (per ATA8-ACS2) |
| | 3 | F | 0b | 1 = Extended number of user addressable sectors is supported (words 230 – 233) |
| | 2–0 | F | 000b | Reserved |
| 70 | – | F | 0000h | Reserved |
| 71 | – | F | 0000h 0000h 0000h 0000h | Reserved for the IDENTIFY PACKET DEVICE command |
| 75 | – | – | – | Queue depth |
| | 15–5 | F | 00000000000b | Reserved |
| | 4–0 | F | 11111b | Maximum queue depth - 1 |

**Table 4: Identify Device (Continued)**

See Note 1 for setting definitions

| Word | Bit(s) | Setting | Default Value | Description |
|---|---|---|---|---|
| 76 | – | – | – | Serial ATA capabilities |
| | 15 | F | 1b | 1 = Supports READ LOG DMA EXT as equivalent to READ LOG EXT |
| | 14 | F | 0b | 1 = Supports Device automatic partial to slumber transitions |
| | 13 | F | 0b | 1 = Supports host automatic partial to slumber transitions |
| | 12 | F | 1b | Native command queuing priority information is supported |
| | 11 | F | 0b | Unload while NCQ commands are outstanding is supported |
| | 10 | F | 1b | Physical event counters are supported |
| | 9 | F | 0b | 1 = Receipt of host-initiated interface power management requests is supported |
| | 8 | F | 1b | Native command queuing is supported |
| | 7–4 | F | 0000b | Reserved for future Serial ATA signaling speed grades |
| | 3 | F | 1b | 1 = Serial ATA Gen-3 speed (6.0 Gb/s) is supported |
| | 2 | F | 1b | 1 = Serial ATA Gen-2 speed (3.0 Gb/s) is supported |
| | 1 | F | 1b | 1 = Serial ATA Gen-1 speed (1.5 Gb/s) is supported |
| | 0 | F | 0b | Reserved (set to 0) |
| 77 | – | – | – | Serial ATA additional capabilities |
| | 15–7 | F | 000000000b | Reserved for future Serial ATA definition |
| | 6 | F | 1b | 1 = Supports RECEIVE FPDMA QUEUED and SEND FPDMA QUEUED commands |
| | 5 | F | 0b | NCQ QUEUE MANAGEMENT command is supported |
| | 4 | F | 0b | NCQ streaming is supported |
| | 3–1 | V | 011b | Coded value indicating current negotiated Serial ATA signal speed |
| | 0 | F | 0b | Shall be cleared to zero |
| 78 | – | – | – | Serial ATA features are supported |
| | 15–7 | F | 000000000b | Reserved |
| | 6 | F | 1b | 1 = Supports software settings preservation |
| | 5 | F | 0b | Reserved |
| | 4 | F | 0b | 1 = In-order data delivery is supported |
| | 3 | F | 0b | 1 = Dev initiate interface power management is supported |
| | 2 | F | 1b | 1 = DMA setup auto-activate optimization is supported |
| | 1 | F | 0b | 1 = Non-zero buffer offsets in DMA setup FIS are supported |
| | 0 | F | 0b | Reserved (set to 0) |

**Table 4: Identify Device (Continued)**

See Note 1 for setting definitions

| Word | Bit(s) | Setting | Default Value | Description |
|---|---|---|---|---|
| 79 | – | – | – | Serial ATA features are enabled |
| | 15–7 | V | 000000000b | Reserved |
| | 6 | V | 1b | 1 = Software settings preservation is enabled |
| | 5 | V | 0b | 1 = Asynchronous notification is enabled |
| | 4 | V | 0b | 1 = In-order data delivery is enabled |
| | 3 | V | 0b | 1 = Device initiating interface power management is enabled |
| | 2 | V | 0b | 1 = DMA setup auto-activate optimization is enabled |
| | 1 | V | 0b | 1 = Non-zero buffer offsets in DMA setup FIS is enabled |
| | 0 | V | 0b | Reserved (set to 0) |
| 80 | – | – | – | Major revision number |
| | 15–10 | F | 000000b | Reserved |
| | 9 | F | 1b | 1 = ATA8-ACS2 is supported |
| | 8 | F | 1b | 1 = ATA8-ACS is supported |
| | 7 | F | 1b | 1 = ATA/ATAPI-7 is supported |
| | 6 | F | 1b | 1 = ATA/ATAPI-6 is supported |
| | 5 | F | 1b | 1 = ATA/ATAPI-5 is supported |
| | 4 | F | 1b | 1 = ATA/ATAPI-4 is supported |
| | 3 | F | 1b | Obsolete |
| | 2 | S | 0b | Obsolete |
| | 1 | S | 0b | Obsolete |
| | 0 | F | 0b | Reserved |
| 81 | – | F | 0028h | Minor revision number |

**Table 4: Identify Device (Continued)**

See Note 1 for setting definitions

| Word | Bit(s) | Setting | Default Value | Description |
|---|---|---|---|---|
| 82 | – | – | – | Command set is supported |
| | 15 | X | 0b | Obsolete |
| | 14 | F | 1b | 1 = NOP command is supported |
| | 13 | F | 1b | 1 = READ BUFFER command is supported |
| | 12 | F | 1b | 1 = WRITE BUFFER command is supported |
| | 11 | X | 0b | Obsolete |
| | 10 | F | 1b | 1 = Host-protected area feature set is supported |
| | 9 | F | 0b | 1 = DEVICE RESET command is supported |
| | 8 | F | 0b | 1 = Service interrupt is supported |
| | 7 | F | 0b | 1 = Release interrupt is supported |
| | 6 | F | 1b | 1 = Read look-ahead is supported |
| | 5 | F | 1b | 1 = Write cache is supported |
| | 4 | F | 0b | Shall be cleared to zero to indicate that the packet feature set is not supported |
| | 3 | F | 1b | 1 = Mandatory power management feature set is supported |
| | 2 | F | 0b | Obsolete |
| | 1 | V | 1b | 1 = Security feature set is supported,<br>Default = 1, 0 when TCG enabled |
| | 0 | F | 1b | 1 = SMART feature set is supported |
| 83 | – | – | – | Command set is supported |
| | 15 | F | 0b | Shall be cleared to zero |
| | 14 | F | 1b | Shall be set to one |
| | 13 | F | 1b | 1 = FLUSH CACHE EXT command is supported |
| | 12 | F | 1b | 1 = Mandatory FLUSH CACHE command is supported |
| | 11 | F | 1b | 1 = Device configuration overlay feature set is supported |
| | 10 | F | 1b | 1 = 48-bit address feature set is supported |
| | 9 | F | 0b | 1 = Automatic acoustic management feature set is supported |
| | 8 | F | 1b | 1 = SET MAX security extension is supported |
| | 7 | F | 0b | See Address Offset Reserved Area Boot INCITS TR27:2001 |
| | 6 | F | 0b | 1 = SET FEATURES subcommand required to spin-up after power-up |
| | 5 | F | 0b | 1 = Power-up in standby feature set is supported |
| | 4 | F | 0b | Obsolete |
| | 3 | F | 1b | 1 = Advanced power management feature set is supported |
| | 2 | F | 0b | 1 = CFA feature set is supported |
| | 1 | F | 0b | 1 = READ/WRITE DMA QUEUED is supported |
| | 0 | F | 1b | 1 = DOWNLOAD MICROCODE command is supported |

**Table 4: Identify Device (Continued)**

See Note 1 for setting definitions

| Word | Bit(s) | Setting | Default Value | Description |
|---|---|---|---|---|
| 84 | – | – | – | Command set/feature-supported extension |
| | 15 | F | 0b | Shall be cleared to zero |
| | 14 | F | 1b | Shall be set to one |
| | 13 | F | 1b | 1 = Idle immediate with unload feature is supported |
| | 12 | F | 0b | Reserved for technical report INCITS TR-37-2004 (TLC) |
| | 11 | F | 0b | Reserved for technical report INCITS TR-37-2004 (TLC) |
| | 10–9 | F | 00b | Obsolete |
| | 8 | F | 1b | 1 = 64-bit word wide name is supported |
| | 7 | F | 0b | 1 = WRITE DMA QUEUED FUA EXT command is supported |
| | 6 | F | 1b | 1 = WRITE DMA FUA EXT and WRITE MULTIPLE FUA EXT commands are supported |
| | 5 | F | 1b | 1 = General purpose logging feature set is supported |
| | 4 | F | 0b | 1 = Streaming feature set is supported |
| | 3 | F | 0b | 1 = Media card pass through command feature set is supported |
| | 2 | F | 0b | 1 = Media serial number is supported |
| | 1 | F | 1b | 1 = SMART self-test is supported |
| | 0 | F | 1b | 1 = SMART error logging is supported |
| 85 | – | – | – | Command set/feature is enabled |
| | 15 | X | 0b | Obsolete |
| | 14 | F | 1b | 1 = NOP command is supported |
| | 13 | F | 1b | 1 = READ BUFFER command is supported |
| | 12 | F | 1b | 1 = WRITE BUFFER command is supported |
| | 11 | X | 0b | Obsolete |
| | 10 | V | 1b | 1 = Host protected area feature set is enabled |
| | 9 | F | 0b | 1 = DEVICE RESET command is supported |
| | 8 | V | 0b | 1 = SERVICE interrupt is enabled |
| | 7 | V | 0b | 1 = Release interrupt is enabled |
| | 6 | V | 1b | 1 = Look-ahead is enabled |
| | 5 | V | 1b | 1 = Write cache is enabled |
| | 4 | F | 0b | Shall be cleared to zero to indicate that the packet feature set is not supported |
| | 3 | F | 1b | Power management feature set is enabled |
| | 2 | F | 0b | Obsolete |
| | 1 | V | 0b | 1 = Security mode feature set is enabled,<br>Default = 0, 1 when TCG enabled |
| | 0 | V | 1b | 1 = SMART feature set is enabled |

**Table 4: Identify Device (Continued)**

See Note 1 for setting definitions

| Word | Bit(s) | Setting | Default Value | Description |
|---|---|---|---|---|
| 86 | – | – | – | Command set/feature is enabled |
| | 15 | | 1b | 1 = Words 120-119 are valid |
| | 14 | F | 0b | 1 = Reserved |
| | 13 | F | 1b | 1 = FLUSH CACHE EXT command is supported |
| | 12 | F | 1b | 1 = FLUSH CACHE command is supported |
| | 11 | F | 1b | 1 = Device configuration overlay is supported |
| | 10 | F | 1b | 1 = 48-bit address feature set is supported |
| | 9 | V | 0b | 1 = Automatic acoustic management feature set is enabled |
| | 8 | F | 0b | 1 = SET MAX security enabled by SET MAX SET PASSWORD |
| | 7 | F | 0b | Reserved for address offset reserved area boot, INCITS TR27:2001 |
| | 6 | F | 0b | 1 = SET FEATURES subcommand required to spin-up after power-up |
| | 5 | V | 0b | 1 = Power-up in standby feature set is enabled |
| | 4 | V | 0b | Obsolete |
| | 3 | V | 1b | 1 = Advanced power management feature set is enabled |
| | 2 | F | 0b | 1 = CFA feature set is supported |
| | 1 | F | 0b | 1 = READ/WRITE DMA QUEUED command is supported |
| | 0 | F | 1b | 1 = DOWNLOAD MICROCODE command is supported |
| 87 | – | – | – | Command set/feature is enabled/supported |
| | 15 | F | 0b | Shall be cleared to zero |
| | 14 | F | 1b | Shall be set to one |
| | 13 | F | 1b | 1 = IDLE IMMEDIATE with UNLOAD FEATURE is supported |
| | 12 | V | 0b | Reserved for technical report- INCITS tr-37-2004 (TLC) |
| | 11 | V | 0b | Reserved for technical report- INCITS TR-37-2004 (TLC) |
| | 10–9 | F | 00b | Obsolete |
| | 8 | F | 1b | 1 = 64-bit word wide name is supported |
| | 7 | F | 0b | 1 = WRITE DMA QUEUED FUA EXT command is supported |
| | 6 | F | 1b | 1 = WRITE DMA FUA EXT and WRITE MULTIPLE FUA EXT commands are supported |
| | 5 | F | 1b | 1 = General purpose logging feature set is supported |
| | 4 | V | 0b | Obsolete |
| | 3 | V | 0b | 1 = Media card pass through command feature set is supported |
| | 2 | V | 0b | 1 = Media serial number is valid |
| | 1 | F | 1b | 1 = SMART self-test is supported |
| | 0 | F | 1b | 1 = SMART error logging is supported |

**Table 4: Identify Device (Continued)**

See Note 1 for setting definitions

| Word | Bit(s) | Setting | Default Value | Description |
|---|---|---|---|---|
| 88 | – | – | 0b | Ultra DMA modes |
| | 15 | – | 0b | Reserved |
| | 14 | – | 0b | 1 = Ultra DMA mode 6 is selected<br>0 = Ultra DMA mode 6 is not selected |
| | 13 | – | 0b | 1 = Ultra DMA mode 5 is selected<br>0 = Ultra DMA mode 5 is not selected |
| | 12 | – | 0b | 1 = Ultra DMA mode 4 is selected<br>0 = Ultra DMA mode 4 is not selected |
| | 11 | – | 0b | 1 = Ultra DMA mode 3 is selected<br>0 = Ultra DMA mode 3 is not selected |
| | 10 | – | 0b | 1 = Ultra DMA mode 2 is selected<br>0 = Ultra DMA mode 2 is not selected |
| | 9 | – | 0b | 1 = Ultra DMA mode 1 is selected<br>0 = Ultra DMA mode 1 is not selected |
| | 8 | – | 0b | 1 = Ultra DMA mode 0 is selected<br>0 = Ultra DMA mode 0 is not selected |
| | 7 | – | 0b | Reserved |
| | 6 | – | 1b | 1 = Ultra DMA mode 6 and below are supported |
| | 5 | – | 1b | 1 = Ultra DMA mode 5 and below are supported |
| | 4 | – | 1b | 1 = Ultra DMA mode 4 and below are supported |
| | 3 | – | 1b | 1 = Ultra DMA mode 3 and below are supported |
| | 2 | – | 1b | 1 = Ultra DMA mode 2 and below are supported |
| | 1 | – | 1b | 1 = Ultra DMA mode 1 and below are supported |
| | 0 | – | 1b | 1 = Ultra DMA mode 0 is supported |
| 89 | – | (O)V | 0001h | Time required for security erase unit completion |
| 90 | – | (O)V | 0001h | Time required for enhanced security erase completion |
| 91 | – | (O)V | 00FEh | Current advanced power management value |
| 92 | – | (O)V | FFFEh | Master password revision code |

**Table 4: Identify Device (Continued)**

See Note 1 for setting definitions

| Word | Bit(s) | Setting | Default Value | Description |
|---|---|---|---|---|
| 93 | – | – | – | Shall be 0000h for SATA devices |
| | 15 | – | 0b | Shall be cleared to zero |
| | 14 | – | 0b | Shall be set to one |
| | 13 | – | 0b | 1 = Device detected CBLID-above $V_{IH}$<br>0 = device detected CBLID-below $V_{IL}$ |
| | – | – | – | Device 1 hardware reset result<br>Device 0 shall clear these bits to zero<br>Device 1 shall set these bits in accordance with the ATA8, ACS2 specification. See specification for details. |
| | 12 | – | 0b | Reserved |
| | 11 | – | 0b | 0 = Device 1 did not assert PDIAG-<br>1 = Device 1 asserted PDIAG- |
| | 10–9 | – | 00b | These bits indicate how device 1 determined the device number:<br>00 = Reserved<br>01 = A jumper was used<br>10 = The CSEL signal was used<br>11 = Some other method was used or the method is unknown |
| | 8 | – | 0b | Shall be set to one |
| | | – | | Device 0 hardware reset result. Device 1 shall clear these bits to zero.<br>Device 0 shall set these bits in accordance with the ATA8, ACS2 specification. See specification for details. |
| | 7 | – | 0b | Reserved |
| | 6 | – | 0b | 0 = Device 0 does not respond when device 1 is selected.<br>1 = Device 0 responds when device 1 is selected |
| | 5 | – | 0b | 0 = Device 0 did not detect the assertion of DASP-<br>1 = Device 0 detected the assertion of DASP- |
| | 4 | – | 0b | 0 = Device 0 did not detect the assertion of PDIAG-<br>1 = Device 0 detected the assertion of PDIAG- |
| | 3 | – | 0b | 0 = Device 0 failed diagnostics.<br>1 = Device 0 passed diagnostics |
| | 2–1 | – | 00b | These bits indicate how device 0 determined the device number:<br>00 = Reserved<br>01 = A jumper was used<br>10 = The CSEL signal was used<br>11 = Some other method was used or the method is unknown |
| | 0 | – | 0b | Shall be set to one |
| 94 | 15–8 | F | 00h | Vendor's recommended acoustic management value |
| | 7–0 | V | 00h | Current automatic acoustic management value |
| 95 | – | (O)V | 0000h | Stream minimum request size |

**Table 4: Identify Device (Continued)**

See Note 1 for setting definitions

| Word | Bit(s) | Setting | Default Value | Description |
|---|---|---|---|---|
| 96 | – | (O)V | 0000h | Streaming transfer time - DMA |
| 97 | – | (O)V | 0000h | Streaming access latency - DMA and PIO |
| 98 | – | (O)F | 0000h 0000h | Streaming performance granularity (98-99) |
| 100 | – | V | Varies by capacity | Maximum user LBA for 48-bit address feature set |
| 104 | – | (O)V | 0000h | Streaming transfer time - PIO |
| 105 | – | ( )F | 0008h | Maximum number of 512-byte blocks of LBA range entries per DATA SET MANAGEMENT command |
| 106 | – | – | – | Physical sector size/logical sector size |
| | 15 | F | 0b | Shall be cleared to zero |
| | 14 | F | 1b | Shall be set to one |
| | 13 | F | 1b | 1 = Device has multiple logical sectors per physical sector |
| | 12 | F | 0b | 1 = Device logical sector longer than 256 Words |
| | 11–4 | F | 00000000b | Reserved |
| | 3–0 | F | 0011b | 8 logical sectors per physical sector |
| 107 | – | (O)F | 0000h | Inter-seek delay for ISO-7779 acoustic testing in microseconds |
| 108 | 15–12 | F | 0101b | NAA (3-0) |
| | 11–0 | – | 000000001010b | IEEE OUI (23-12) |
| 109 | 15–4 | F | 000001110101b | IEEE OUI (11-0) |
| | 3–0 | – | Varies | Unique ID (35-32) |
| 110 | – | (M)F | Varies | 5-0 unique ID (31-16) |
| 111 | – | (M)F | Varies | Unique ID (15-0) |
| 112 | – | (O)F | 0000h 0000h 0000h 0000h | Reserved for 128-bit world wide name extension to 128 bits |
| 116 | – | (O)V | 0000h | Reserved for INCITS TR-37-2004 |
| 117 | – | (O)F | 0000h 0000h | Words per logical sector |

**Table 4: Identify Device (Continued)**

See Note 1 for setting definitions

| Word | Bit(s) | Setting | Default Value | Description |
|---|---|---|---|---|
| 119 | – | – | – | Commands and feature sets are supported (continued from words 84-82) |
| | 15 | F | 0b | Shall be cleared to zero |
| | 14 | F | 1b | Shall be set to one |
| | 13–8 | F | 00000000b | Reserved |
| | 7 | F | 0b | 1 = Extended power conditions feature set is supported |
| | 6 | F | 0b | 1 = Extended status reporting feature set is supported |
| | 5 | F | 0b | 1 = Free-fall control feature set is supported |
| | 4 | F | 1b | 1 = DOWNLOAD MICROCODE command with mode 3 supported |
| | 3 | F | 1b | 1 = READ LOG DMA EXT and WRITE LOG DMA EXT commands supported |
| | 2 | F | 1b | 1 = Write uncorrectable EXT command is supported |
| | 1 | F | 1b | 1 = Write-read-verify feature set is supported |
| | 0 | F | 0b | Reserved for DDT |
| 120 | – | – | – | Commands and feature sets are supported or enabled (continued from words 87-85) |
| | 15 | – | 0b | Shall be cleared to zero |
| | 14 | – | 1b | Shall be set to one |
| | 13–6 | – | 00000000b | Reserved |
| | 5 | – | 0b | 1 = Free-fall control feature set is enabled |
| | 4 | – | 1b | 1 = The DOWNLOAD MICROCODE command with mode 3 is supported |
| | 3 | – | 1b | 1 = The READ LOG DMA EXT and WRITE LOG DMA EXT commands are supported |
| | 2 | – | 1b | 1 = The WRITE UNCORRECTABLE EXT command is supported |
| | 1 | – | 0b | 1 = The write-read-verify feature set is enabled |
| | 0 | – | 0b | 1 = The disable data transfer after error detection feature set is enabled<br>0 = The disable data transfer after error detection feature set is disabled |
| 121 | – | F | 0000h 0000h 0000h 0000h 0000h 0000h | Reserved for expanded, supported, and enabled settings |
| 127 | – | (O) | 0000h | Obsolete |

**Table 4: Identify Device (Continued)**

See Note 1 for setting definitions

| Word | Bit(s) | Setting | Default Value | Description |
|---|---|---|---|---|
| 128 | – | – | – | Security status |
| | 15–9 | V | 0000000b | Reserved |
| | 8 | V | 0b | Security level 0 = High, 1 = Maximum |
| | 7–6 | F | 00b | Reserved |
| | 5 | V | 1b | 1 = Enhanced security erase is supported |
| | 4 | V | 0b | 1 = Security count is expired |
| | 3 | V | 0b | 1 = Security is frozen |
| | 2 | V | 0b | 1 = Security is locked |
| | 1 | V | 0b | 1 = Security is enabled |
| | 0 | V | 1b | 1 = Security is supported |
| 129 | – | ( )X | Vendor-specific data | Vendor specific |
| 160 | – | – | – | CFA power mode 1 |
| | 15 | F | 0b | Word 160 is supported |
| | 14 | F | 0b | Reserved |
| | 13 | F | 0b | CFA power mode 1 is required for one or more commands implemented by the device |
| | 12 | V | 0b | CFA power mode 1 is disabled |
| | 11–0 | F | 000000000000b | Maximum current in ma |
| 161 | – | X | 0000h 0000h 0000h 0000h 0000h 0000h 0000h 0000h | Reserved for assignment by the CompactFlash Association |
| 168 | 15–4 | F | 000h | Reserved |
| | 3-0 | F | Varies | Device nominal form factor; 3h = 2.5", 4h = 1.8" |
| 169 | – | – | – | DATA SET MANAGEMENT command is supported |
| | 15–1 | F | 000000000000000b | Reserved |
| | 0 | F | 1b | 1 = The trim bit in the DATA SET MANAGEMENT command is supported |
| 170 | – | F | 0000h 0000h 0000h 0000h | Additional product identifier |
| 174 | – | F | 0000h 0000h | Reserved |
| 176 | – | (O)V | Varies | Current media serial number (60 ASCII characters) |

**Table 4: Identify Device (Continued)**

See Note 1 for setting definitions

| Word | Bit(s) | Setting | Default Value | Description |
|---|---|---|---|---|
| 206 | – | – | – | SCT command transport |
| | 15–12 | X | 0000b | Vendor-specific |
| | 11–6 | F | 000000b | Reserved |
| | 5 | F | 1b | SCT command transport data tables are supported |
| | 4 | F | 1b | SCT command transport features control is supported |
| | 3 | F | 0b | SCT command transport error recovery control is supported |
| | 2 | F | 1b | SCT command transport write same is supported |
| | 1 | F | 0b | SCT command transport long sector access is supported |
| | 0 | F | 1b | SCT command transport is supported |
| 207 | – | ( )F | 0000h 0000h | Reserved for CE-ATA |
| 209 | – | (O) | – | Alignment of logical blocks within a larger physical block |
| | 15 | F | 0b | Shall be cleared to zero |
| | 14 | F | 1b | Shall be set to one |
| | 13–0 | F | 00000000000000b | Logical sector offset within the first physical sector where the first logical sector is placed |
| 210 | – | (O)V | 0000h 0000h | Write-read-verify sector count mode 3 only |
| 212 | – | (O)F | 0000h 0001h | Verify sector count mode 2 only |
| 214 | – | (O) | – | NV cache capabilities |
| | 15–12 | F | 0000b | NV cache feature set version |
| | 11–8 | F | 0000b | NV cache power mode feature set version |
| | 7–5 | F | 000b | Reserved |
| | 4 | V | 0b | 1 = NV cache feature set is enabled |
| | 3–2 | F | 00b | Reserved |
| | 1 | V | 0b | 1 = NV cache power mode feature set is enabled |
| | 0 | F | 0b | 1 = NV cache power mode feature set is supported |
| 215 | – | (O)V | 0000h | NV cache size in logical blocks (LSW) |
| 216 | – | (O)V | 0000h | NV cache size in logical blocks (MSW) |
| 217 | – | (M)F | 0001h | Nominal media rotation rate (ATA8-ACS 1699-D revision 6) |
| | – | – | – | NV cache read transfer speed in MB/s (ATA8-ACS 1699-D revision 3f) |
| 218 | – | (O)V | 0000h | NV cache write transfer speed in MB/s |
| 219 | – | – | – | NV cache options |
| | 15–8 | F | 00h | Reserved |
| | 7–0 | F | 00h | Device estimated time to spin-up in seconds |
| 220 | 15–8 | F | 00h | Reserved |
| | 7–0 | V | 00h | Write-read-verify feature set current mode |
| 221 | – | – | 0000h | Reserved |

**Table 4: Identify Device (Continued)**

See Note 1 for setting definitions

| Word | Bit(s) | Setting | Default Value | Description |
|---|---|---|---|---|
| 222 | – | – | – | Transport major revision number. 0000h or FFFFh = Device does not report version |
| | 15–12 | – | 0001b | Transport type - 0 = Parallel, 1 = Serial, 2–15 = Reserved Parallel (type = 0), serial (type = 1) |
| | 11–7 | – | 000000b | Reserved |
| | 6 | – | 1b | 1 = SATA rev 3.1 is supported |
| | 5 | – | 1b | Reserved SATA rev 3.0 |
| | 4 | – | 1b | Reserved SATA rev 2.6 |
| | 3 | – | 1b | Reserved SATA rev 2.5 |
| | 2 | – | 1b | Reserved SATA II: Extensions |
| | 1 | – | 1b | Reserved SATA 1.0a |
| | 0 | – | 1b | ATA8-APT ATA8-AST |
| 223 | – | (M)F | 0000h | Transport minor revision number |
| 224 | – | ( )F | 0000h 0000h 0000h 0000h 0000h 0000h 0000h 0000h | Reserved for CE-ATA |
| 234 | – | (O)F | 0001h | Minimum number of 512-byte units per DOWNLOAD MICRO-CODE command for mode 3 |
| 235 | – | – | 00FFh | Maximum number of 512-byte units per DOWNLOAD MICRO-CODE command for mode 3 |
| 236 | – | – | 0000h 0000h 0000h 0000h 0000h 0000h 0000h | Reserved |
| 243 | – | – | 4000h | Bit 14 = 1; supports FDE security features |
| 244 | – | – | 0000h 0000h 0000h 0000h 0000h 0000h 0000h 0000h 0000h | Reserved |
| 255 | – | (M)F | – | Integrity word |
| | 15–8 | – | Varies | Checksum |
| | 7–0 | – | A5h | Signature |

Note: 1. F = The content of the word is fixed and does not change.
V = The content of the word is variable and may change depending on the state of the device or the commands executed by the device.
X = The content of the word may be fixed or variable.
R = The content of the word is reserved and will be zero.
M = Support of the word is mandatory.
O = Support of the word is optional.

# Commands

### Table 5: Supported ATA Command Set

See ATA-8 standard for command details

| Command Name | Command Code (hex) |
|---|---|
| CHECK POWER MODE | 98h or E5h |
| DATA SET MANAGEMENT | 06h |
| DEVICE CONFIGURATION RESTORE | B1h/C0h |
| DEVICE CONFIGURATION FREEZE LOCK | B1h/C1h |
| DEVICE CONFIGURATION IDENTIFY | B1h/C2h |
| DEVICE CONFIGURATION SET | B1h/C3h |
| DOWNLOAD MICROCODE | 92h |
| EXECUTE DEVICE DIAGNOSTIC | 90h |
| FLUSH CACHE | E7h |
| FLUSH CACHE EXT | EAh |
| IDENTIFY DEVICE | ECh |
| IDLE | E3h or 97h |
| IDLE IMMEDIATE | E1h or 95h |
| INITIALIZE DEVICE PARAMETERS | 91h |
| NOP | 00h |
| READ BUFFER | E4h |
| READ DMA (with retry) | C8h |
| READ DMA (without retry) | C9h |
| READ DMA EXT | 25h |
| READ FPDMA QUEUED | 60h |
| READ LOG EXT | 2Fh |
| READ LOG DMA EXT | 47h |
| READ MULTIPLE | C4h |
| READ MULTIPLE EXT | 29h |
| READ NATIVE MAX ADDRESS | F8h |
| READ NATIVE MAX ADDRESS EXT | 27h |
| READ SECTOR(S) EXT | 24h |
| READ SECTOR(S) (with retry) | 20h |
| READ SECTOR(S) (without retry) | 21h |
| READ VERIFY SECTOR EXT | 42h |
| READ VERIFY SECTOR(S) (with retry) | 40h |
| REQUEST SENSE DATA EXT | 0Bh |
| SANITIZE DEVICE | B4h |
| SECURITY DISABLE PASSWORD | F6h |
| SECURITY ERASE PREPARE | F3h |
| SECURITY ERASE UNIT | F4h |

**Table 5: Supported ATA Command Set (Continued)**

See ATA-8 standard for command details

| Command Name | Command Code (hex) |
|---|---|
| SECURITY FREEZE LOCK | F5h |
| SECURITY SET PASSWORD | F1h |
| SECURITY UNLOCK | F2h |
| SEEK | 70h |
| SET FEATURES | EFh |
| SET MAX ADDRESS | F9h |
| SET MAX ADDRESS EXT | 37h |
| SET MULTIPLE MODE | C6h |
| SLEEP | E6h or 99h |
| SMART DISABLE OPERATIONS | B0h/D9h |
| SMART ENABLE OPERATIONS | B0h/D8h |
| SMART ENABLE/DISABLE AUTOSAVE | B0h/D2h |
| SMART EXECUTE OFF-LINE IMMEDIATE | B0h/D4h |
| SMART READ DATA | B0h/D0h |
| SMART READ LOG | B0h/D5h |
| SMART RETURN STATUS | B0h/DAh |
| SMART WRITE LOG | B0h/D6h |
| STANDBY | E2h or 96h |
| STANDBY IMMEDIATE | E0h or 94h |
| TRUSTED NON-DATA | 5Bh |
| TRUSTED RECEIVE | 5Ch |
| TRUSTED RECEIVE DMA | 5Dh |
| TRUSTED SEND | 5Eh |
| TRUSTED SEND DMA | 5Fh |
| WRITE BUFFER | E8h |
| WRITE DMA (with retry) | CAh |
| WRITE DMA (without retry) | CBh |
| WRITE DMA EXT | 35h |
| WRITE DMA FUA EXT | 3Dh |
| WRITE FPDMA QUEUED | 61h |
| WRITE LOG EXT | 3Fh |
| WRITE LOG DMA EXT | 57h |
| WRITE MULTIPLE | C5h |
| WRITE MULTIPLE EXT | 39h |
| WRITE MULTIPLE FUA EXT | CEh |
| WRITE SECTOR(S) (with retry) | 30h |
| WRITE SECTOR(S) EXT | 34h |

**Table 5: Supported ATA Command Set (Continued)**

See ATA-8 standard for command details

| Command Name | Command Code (hex) |
|---|---|
| WRITE UNCORRECTABLE EXT | 45h |

# Performance

Measured performance can vary for a number of reasons. The major factors affecting drive performance are the density of the drive and the interface of the host. Additionally, overall system performance can affect the measured drive performance. When comparing drives, it is recommended that all system variables are the same, and only the drive being tested varies.

Performance numbers will vary depending on the host system configuration.

**Table 6: Drive Performance**

| Density | 120GB | 240GB | 480GB | 800GB | Unit |
|---|---|---|---|---|---|
| Sequential read (128KB transfer) | 425 | 425 | 425 | 425 | MB/s |
| Sequential write (128KB transfer) | 200 | 330 | 375 | 375 | MB/s |
| Random read (4KB transfer) | 63,000 | 63,000 | 63,000 | 65,000 | IOPS |
| Random write (4KB transfer) | 23,000 | 33,000 | 35,000 | 24,000 | IOPS |
| READ latency (TYP) | 0.50 | 0.50 | 0.50 | 0.50 | ms |
| WRITE latency (TYP) | 1.5 | 1.5 | 1.5 | 1.5 | ms |

Notes:
1. Typical I/O performance numbers as measured using Iometer with a queue depth of 32 and write cache disabled.
2. Iometer measurements are performed in the steady state region.
3. 4KB transfers used for READ/WRITE latency values.
4. System variations may affect measured results.

# Reliability

Micron's SSDs incorporate advanced technology for defect and error management. They use various combinations of hardware-based error correction algorithms and firmware-based static and dynamic wear-leveling algorithms.

Over the life of the SSD, uncorrectable errors may occur. An uncorrectable error is defined as data that is reported as successfully programmed to the SSD but when it is read out of the SSD, the data differs from what was programmed.

**Table 7: Uncorrectable Bit Error Rate**

| Uncorrectable Bit Error Rate | Operation |
|---|---|
| <1 sector per $10^{16}$ bits | READ |

## Mean Time to Failure

Mean time to failure (MTTF) for the SSD can be predicted based on the component reliability data using the methods referenced in the Telcordia SR-332 reliability prediction procedures for electronic equipment.

**Table 8: MTTF**

| Density | MTTF (Operating Hours)[1] |
|---|---|
| 120GB | 2 million |
| 240GB | 2 million |
| 480GB | 2 million |
| 800GB | 2 million |

Note: 1. The product achieves a MTTF of 2 million hours based on population statistics not relevant to individual units.

## Endurance

Endurance for the SSD can be predicted based on the usage conditions applied to the device, the internal NAND component cycles, the write amplification factor, and the wear-leveling efficiency of the drive. Total bytes written measured with 55°C case temperature within the total bytes written values listed in this document. The table below shows the drive lifetime for each SSD density based on predefined usage conditions.

**Table 9: Drive Lifetime**

| Density | Drive Lifetime (Total Bytes Written) |
|---|---|
| 120GB | 0.5PB |
| 240GB | 1.0PB |
| 480GB | 1.9PB |
| 800GB | 1.9PB |

Note: 1. Total bytes written were calculated assuming drive is 100% full (user capacity) and a workload of 100% random, aligned 4KB writes.

# Electrical Characteristics

Stresses greater than those listed may cause permanent damage to the device. This is a stress rating only, and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

### Table 10: SATA Power Consumption

| Density | Idle Average | Sequential Write Max (128KB transfer) | Sequential Read Max (128KB transfer) |
|---|---|---|---|
| 120GB | 1.2W | 4W | <4W |
| 240GB | 1.2W | 5W | <5W |
| 480GB | 1.2W | 6W | <6W |
| 800GB | 1.2W | 6.3W | <6.3W |

Notes:
1. Data taken at 25°C using a 6 Gb/s SATA interface.
2. Sequential power measured during Iometer with 128KB transfer, RMS average over a 500ms window.

### Table 11: Maximum Ratings

| Parameter/Condition | Symbol | Min | Max | Unit |
|---|---|---|---|---|
| Voltage input | V5 | 4.5 | 5.5 | V |
| Operating temperature | $T_C$ | 0 | 70 | °C |
| Non-operating temperature | – | –40 | 85 | °C |
| Rate of temperature change | – | – | 20 | °C/hour |
| Relative humidity (non-condensing) | – | 5 | 95 | % |

### Table 12: Shock and Vibration

| Parameter/Condition | Specification |
|---|---|
| Operating shock | 1500G/0.5ms |
| Operating vibration | 10–500Hz at 3.1G |

# Compliance

Micron SSDs comply with the following:

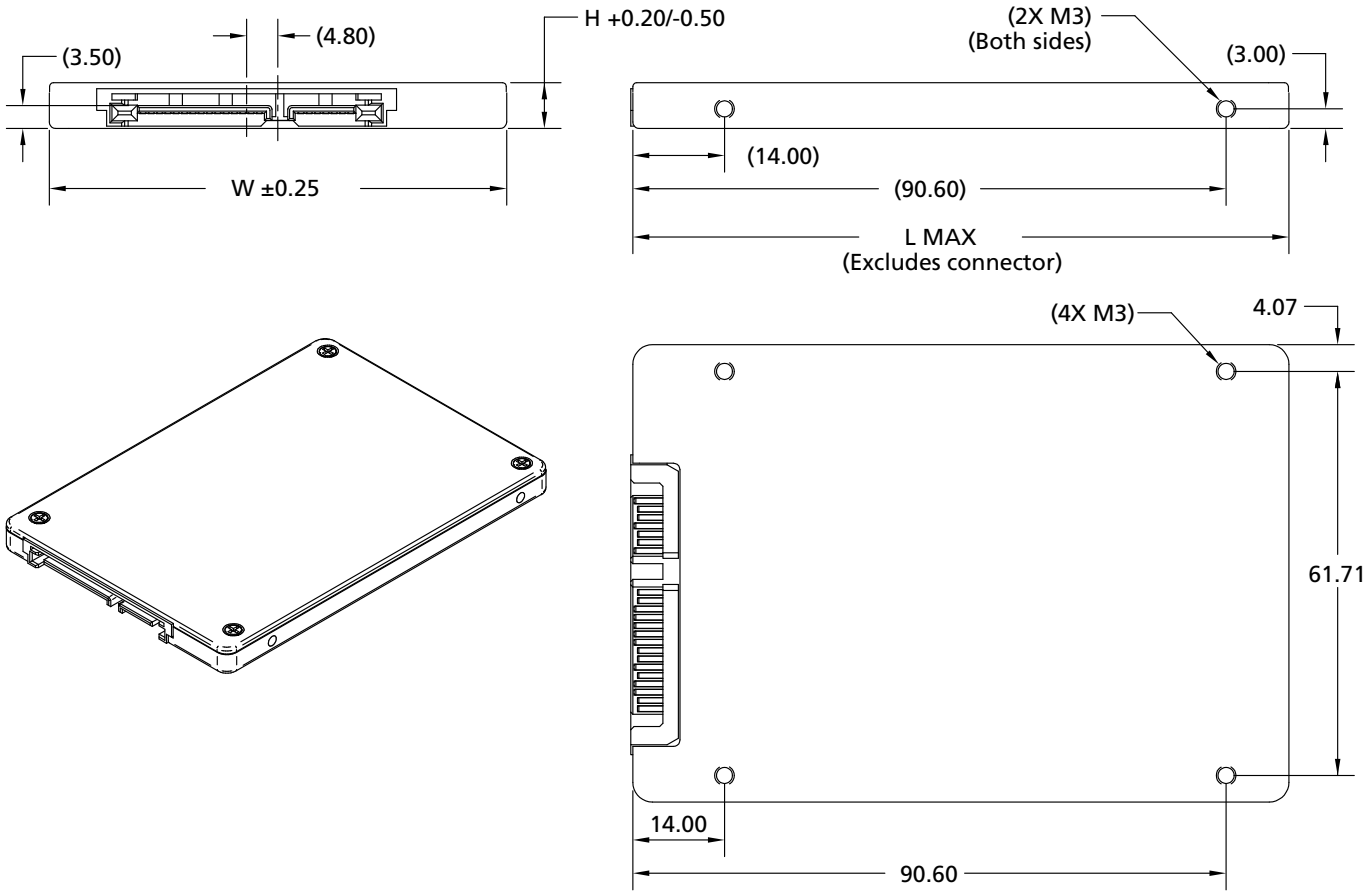
- RoHS
- CE (Europe): EN55022, 2006 + A1:2007 and EN55024, 1998 + A1:2001 + A2:2003
- FCC: CFR Title 47, Part 15 Class A
- UL/cUL: approval to UL-60950-1, 2nd Edition, IEC 60950-1:2005 (2nd Edition); Am 1:2009, EN 60950-1 (2006) + A11:2009+ A1:2010 + A12:2011
- BSMI (Taiwan): approval to CNS 13438
- C-TICK (Australia, New Zealand): approval to AS/NZS CISPR22
- KCC RRL (Korea): approval to KCC-REM-MU2-P400m25
- W.E.E.E.: Compliance with EU WEEE directive 2002/96/EC. Additional obligations may apply to customers who place these products in the markets where WEEE is enforced
- TUV (Germany): approval to IEC60950/EN60950
- $V_{CCI}$
- IC (Canada):
  - This Class B digital apparatus complies with Canadian ICES-003.
  - Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

## FCC Rules

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

# Physical Configuration

**Figure 4: 2.5-Inch Package – 7mm**



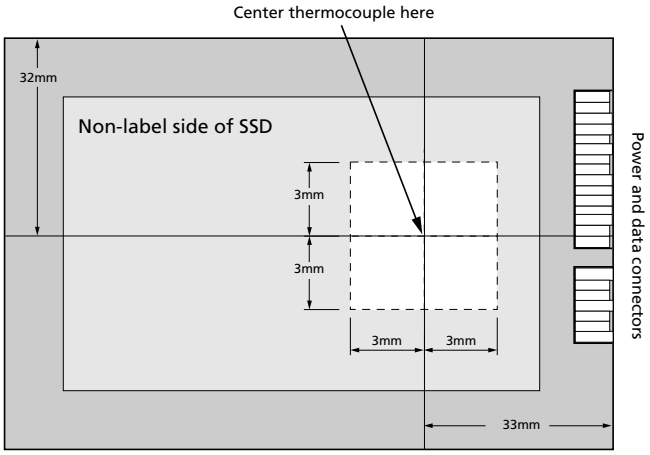

Note: 1. All dimensions are in millimeters.

**Table 13: 2.5-Inch Package Dimensions**

| Density (GB) | W | L | H | Unit |
|---|---|---|---|---|
| 120 | 69.85 | 100.45 | 7.00 | mm |
| 240 | | | | |
| 480 | | | | |
| 800 | | | | |

Note: 1. Dimension values in millimeter per SFF 8201 Rev. 3.3.

**Figure 5: Thermocouple Placement Guidelines for Temperature Measurement**




# References

- Serial ATA: High-speed serialized AT attachment, Serial ATA working group, available at www.sata-io.org
- SATA 3.1 GOLD
- ATA-8 ACS2 (T13/2015, Rev. 4)
- Trusted Computing Group (TCG) Enterprise Specification Version 1.00 Revision Final, Revision 3.00 January 10, 2011. Available at www.trustedcomputinggroup.org
- SFF-8201 Rev. 3.3

# Revision History

## Rev. C – 9/16

- Updated specifications to comply with SFF-8201 Rev 3.3
- Corrected thermal thermocouple placement

## Rev. B – 8/15

- Updated ATA-8 ACS-2 reference

## Rev. A – 4/15

- Initial release

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This data sheet contains minimum and maximum limits specified over the power supply and temperature range set forth herein. Although considered final, these specifications are subject to change, as further product development and data characterization sometimes occur.