

UD info Corp.

Industrial SATA Solid State Drive
HF3-25UD(8-ch) Series
Product DataSheet

UD info CORP.

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Revision History

Revision	Draft Date	History	Author
1.0	2014/6/18	New release	Golden Lee
1.1	2014/11/11	Modify Partnumber decoder	Golden Lee



Product Overview

- **Capacity**
 - SLC: 8GB up to 512GB
 - MLC: 16GB up to 1TB
 - pSLC: 8GB up to 512GB
- **SATA Interface**
 - SATA Revision 3.0
 - SATA 1.5Gbps, 3Gbps, and 6Gbps interface
- **Flash Interface**
 - Flash Type: SLC,MLC and pSLC
- **Performance**
 - Read: up to 520 MB/s
 - Write: up to 490 MB/s
- **Power Consumption^{Note1}**
 - Active mode: < 6430mW
 - Idle mode: < 355mW
- **TBW (Terabyte Written)**
 - SLC: 29367 TBW for 512GB
 - MLC: 2580 TBW for 1TB
 - pSLC: 9194 TBW for 512GB
- **MTBF**
 - SLC: 3,000,000 hours
 - MLC: 2,000,000 hours
 - pSLC: 2,500,000 hours
- **Advanced Flash Management**
 - Static and Dynamic Wear Leveling
 - Bad Block Management
 - TRIM
 - SMART
 - Over-Provision
- **Low Power Management**
 - DIPM/HIPM Mode
- **Temperature Range**
 - Operation (Standard): 0°C ~ 70°C
 - Operation (Wide): -40°C ~ 85°C
 - Storage: -40°C ~ 85°C
- **Compliant**
 - RoHS
 - CE & FCC

Notes:

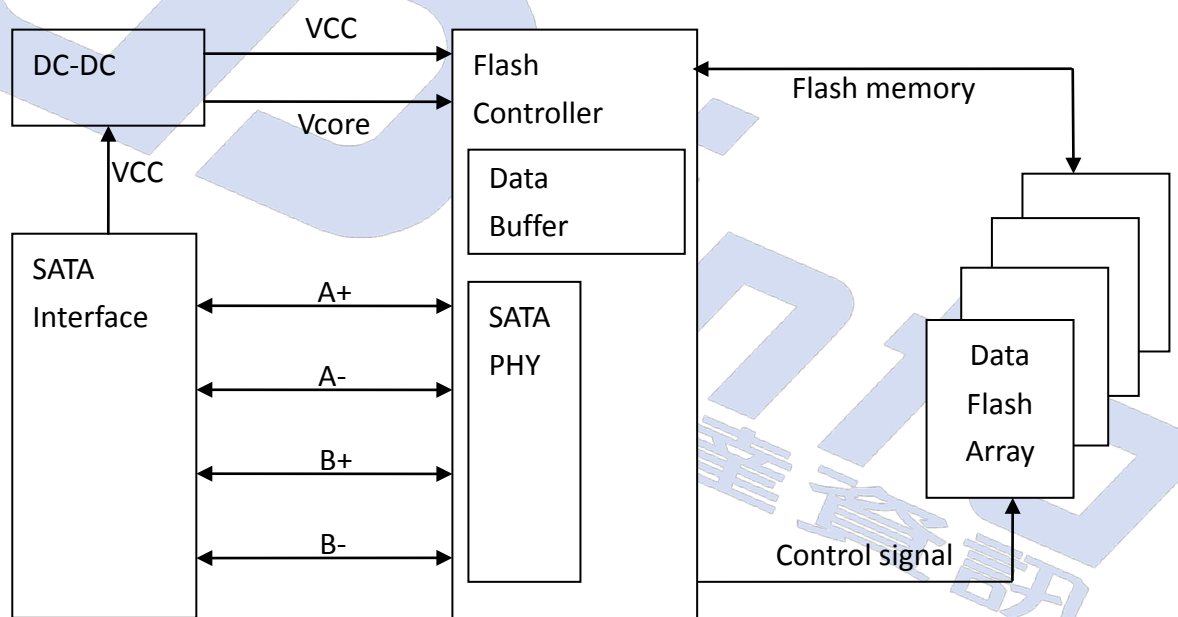
1. Please see "Power Consumption" for details.

1. INTRODUCTION

1.1. General Description

UDinfo 2.5" SATA SSD delivers all the advantages of flash disk technology with Serial ATA I/II/III interface, including being fully compliant with standard 2.5-inch form factor, providing low power consumption compared to traditional hard drive and hot-swapping when removing/replacing/upgrading flash disks. The device is designed based on the standard 7-pin interface for data segment and 15-pin for power segment, as well as operating at a maximum operating frequency of 300MHz with 40MHz external crystal. Its capacity could provide a wide range up to 1TB. Moreover, it can reach up to 520MB/s read as well as 490MB/s write high performance based on Toshiba's NAND flash (with 256MB/512MB DDR3 cache enabled and measured by CrystalDiskMark v3.0). Meanwhile, the power consumption of the 2.5" SSD is much lower than traditional hard drives.

1.2. Block Diagram



2.5" SATA SSD Block Diagram

2. PRODUCT SPECIFICATIONS



- **Capacity**
 - SLC: From 8GB up to 512GB
 - MLC: From 16GB up to 1TB
 - pSLC: From 8GB up to 512GB
- **Electrical/Physical Interface**
 - SATA Interface
 - ◆ Compliant with SATA Revision 3.0
 - ◆ Compatible with SATA 1.5Gbps, 3Gbps and 6Gbps interface
 - ◆ Support power management
 - ◆ Support expanded register for SATA protocol 48 bits addressing mode
 - ◆ Embedded BIST function for SATA PHY for low cost mass production
- **Supported NAND Flash**
 - Toshiba SLC and MLC, Toggle1.0 and Toggle2.0
 - Supports SLC large block 4K, 8K/page NAND flash
 - Supports MLC large block 16K/page NAND flash
 - Support ONFI 2.3 and ONFI 3.0 interface: 5 channels at maximum
- **ECC Scheme**
 - Up to 72 bits / 1K Byte
- **UART function**
- **GPIO**
- **Support SMART and TRIM commands**

3. ENVIRONMENTAL SPECIFICATIONS



3.1. Environmental Conditions

3.1.1. Temperature and Humidity

- Temperature:
 - ◆ Storage: -40°C to 85°C
 - ◆ Operational (Standard grade): 0°C to 70°C
 - ◆ Operational (Wide grade): -40°C to 85°C
- Humidity:
 - ◆ Standard grade: RH 90% under 40°C (operational)
 - ◆ Wide grade: RH 95% under 55°C (operational)

■ High Temperature Test Condition

	Temperature	Humidity	Test Time
Operation (Standard)	70°C	0% RH	72 hours
Operation (Wide)	85°C	0% RH	72 hours
Storage (Standard)	85°C	0% RH	72 hours
Storage (Wide)	85°C	0% RH	168 hours

Result: No any abnormality is detected.

■ Low Temperature Test Condition

	Temperature	Humidity	Test Time
Operation (Standard)	0°C	0% RH	72 hours
Operation (Wide)	-40°C	0% RH	72 hours
Storage (Standard)	-40°C	0% RH	72 hours
Storage (Wide)	-40°C	0% RH	168 hours

Result: No any abnormality is detected.

■ High Humidity Test Condition

	Temperature	Humidity	Test Time
Operation (Standard)	40°C	93% RH	24 hours
Operation (Wide)	55°C	95% RH	72 hours
Storage (Standard)	40°C	95% RH	72 hours
Storage (Wide)	55°C	95% RH	96 hours

Result: No any abnormality is detected.

■ Temperature Cycle Test

	Temperature	Test Time	Cycle
Operation (Standard)	0°C	30 min	10 cycles
	70°C	30 min	
Operation (Wide)	-40°C	30 min	20 cycles
	85°C	30 min	
Storage (Standard)	-40°C	30 min	10 cycles
	85°C	30 min	
Storage (Wide)	-40°C	30 min	50 cycles
	85°C	30 min	

Result: No any abnormality is detected.

3.1.2. Shock

■ Shock Specification

	Acceleration Force	Half Sin Pulse Duration
Non-Operational	1500G	0.5ms
Operational	1500G	0.5ms

Result: No any abnormality is detected when power on.

3.1.3. Vibration

■ Vibration Specification

	Condition		Vibration Orientation
	Frequency/Displacement	Frequency/Acceleration	
Operational	20Hz~80Hz/1.52mm	80Hz~2000Hz/20G	X, Y, Z axis/60 min for each

Result: No any abnormality is detected when power on.

3.1.4. Drop

■ Drop Specification

	Height of Drop	Number of Drop
Non-operational	80cm free fall	6 face of each unit

Result: No any abnormality is detected when power on.

3.1.5. Bending

■ Bending Specification

	Force	Action
Non-operational	≥ 50N	Hold 1min/5times

Result: No any abnormality is detected when power on.

3.1.6. Torque

■ Torque Specification

	Force	Action
Non-operational	1.263N-m or 10 deg	Hold 1min/5times

Result: No any abnormality is detected when power on.

3.1.7. Electrostatic Discharge (ESD)

■ Contact ESD Specification

Device	Capacity	Temperature	Relative Humidity	+/- 4KV	Result
HF3 2.5"SSD	256GB	24.0°C	49% (RH)	Device functions are affected, but EUT will be back to its normal or operational state automatically.	PASS

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 UDinfo's 2.5" SATA SSD is up to 3,000,000 hours.

3.3. Certification

- RoHS
- CE / FCC

3.4. Compliance

- SATA III (SATA Rev. 3.0)
- Up to ATA/ATAPI-8 (Including S.M.A.R.T)

4. ELECTRICAL SPECIFICATIONS



4.1. Supply Voltage

Parameter	Rating
Operating Voltage	5V

4.2. Power Consumption

Current	Read	Write	Partial	Slumber	Idle
SLC (max.)	6055	6430	105	85	355
MLC (max.)	4210	5375	105	85	325
pSLC (max.)	4700	4850	105	85	315

Unit: mW

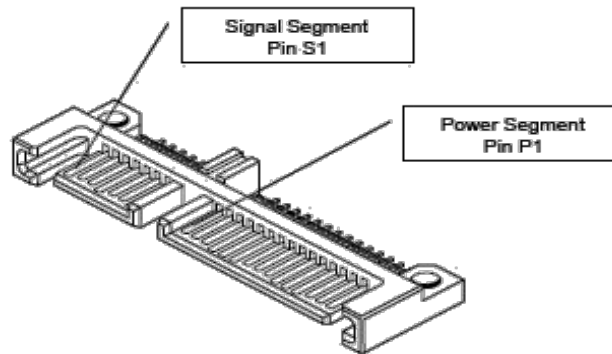
NOTES:

1. It's average value of power consumption based on 100% conversion efficiency.
2. The measured power voltage is 5V.
3. Samples were built using Toshiba NAND flash and measured under normal temperature.
4. Sequential R/W is measured while testing 4000MB sequential R/W 5 times by CrystalDiskMark.
5. Power Consumption may differ according to flash configuration, SDR configuration, or platform.

5. INTERFACE



5.1. Pin Assignment and Descriptions



Signal Segment Pin Assignment	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)
Power Segment Pin Assignment	Pin Number	Function
	P1	Not Used (3.3V)
	P2	Not Used (3.3V)
	P3	Not Used (3.3V)
	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

Op Code	Description	Op Code	Description
E5h	Check power mode	F6h	Security Disable Password
06h	Data Set management	F3h	Security Erase Prepare
B1H	DCO	F4h	Security Erase Unit
92h	Download Microcode PIO	F5h	Security Freeze Lock
93h	Download Microcode DMA	F1h	Security Set Password
90h	Execute drive diagnostic	F2h	Security Unlock
E7h	Flush cache	70h	Seek
Eah	Flush cache Ext	Efh	Set features
Ech	Identify device	F9h	Set Max Address
E3h	Idle	37h	Set Max Address Ext
E1h	Idle immediate	C6h	Set multiple mode
91h	Initialize drive parameters	E6h	Sleep
E4h	Read buffer	B0h	Smart
C9h	Read DMA (w/o retry)	E2h	Standby
C8h	Read DMA (w/retry)	E0h	Standby immediate
25h	Read DMA Ext	E8h	Write buffer
60h	Read FPDMA QUEUED	CBh	Write DMA (w/o retry)
2Fh	Read Log Ext	Cah	Write DMA (w/retry)
C4h	Read multiple	35h	Write DMA Ext
29h	Read multiple Ext	3Dh	Write DMA FUA Ext
F8h	Read native max address	61h	Write FPDMA QUEUED
27h	Read native max Ext	3Fh	Write Log Ext
21h	Read sector(s) (w/o retry)	C5h	Write multiple
20h	Read sector(s) (w/retry)	39h	Write multiple Ext
24h	Read sector(s) Ext	Ceh	Write multiple FUA Ext
42h	Read Verify Ext	31h	Write sector(s) (w/o retry)
41h	Read verify sector(s) (w/o retry)	30h	Write sector(s) (w/retry)
40h	Read verify sector(s) (w/retry)	34h	Write sector(s) Ext
10h	Recalibrate	45h	Write uncorrectable

6.2. Identify Device Data

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

Word	F: Fixed V: Variable 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 (xxxxxxxx)
47	F	8010h	7:0- Maximum number of sectors transferred per interrupt on MULTIPLE commands
48	F	0000h	Reserved
49	F	2F00h	Capabilities
50	F	4000h	Capabilities
51-52	X	00000000h	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

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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	0000000000000000 0h	Reserved for the IDENTIFY PACKET DEVICE command
75	F	001Fh	Queue depth
76	F	C70Eh	Serial SATA capabilities
77	F	0000h	Reserved for future Serial ATA definition
78	F	004Ch	Serial ATA features supported
79	V	0040H	Serial ATA features enabled
80	F	01F8h	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	6023h	Command set/feature default
88	V	007Fh	Ultra DMA Modes
89	F	001Eh	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. The contents of the bits (12:0) of this word can be changed only during the execution of hardware reset.
94	V	0000h	Vendor's recommended and actual acoustic management value
95	F	0000h	Stream Minimum Request Size
96	V	0000h	Streaming Transfer Time – DMA
97	V	0000h	Streaming Access Latency – DMA and PIO

Word	F: Fixed V: Variable X: Both	Default Value	Description
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	0000h	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	0000000000000000 0h	Unique ID
112-115	F	0000000000000000 0h	Reserved
116	V	0000h	Reserved
117-118	F	00000000h	Words per logical Sector
119	F	4015h	Supported settings
120	F	4015h	Command set/Feature Enabled/Supported
121-126	F	0h	Reserved
127	F	0h	Removable Media Status Notification feature set support
128	V	0021h	Security status
129-159	X	0h	Vendor specific
160	F	0h	Compact Flash Association (CFA) power mode 1
161-167	X	0h	Reserved for assignment by the CFA
168	F	3h 2.5 inch 4h 1.8 inch 5h Less than 1.8 inch	Device Nominal Form Factor
169	F	0001h	DATA SET MANAGEMENT command is supported
170-173	F	0h	Additional Product Identifier
174-175		0h	Reserve
176-205	V	0h	Current media serial number
206	F	0h	SCT Command Transport(
207-208	F	0h	Reserved
209	F	4000h	Alignment of logical blocks within a physical block
210-211	V	0000h	Write-Read-Verify Sector Count Mode 3 (not support)
212-213	F	0000h	Write-Read-Verify Sector Count Mode 2 (not support)

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Word	F: Fixed V: Variable X: Both	Default Value	Description
214-216		0000h	NV Cache relate (not support)
217	F	0001h	Non-rotating media device
218	F	0h	Reserved
219	F	0h	NV Cache relate (not support)
220	V	0h	Write read verify feature set current mode
221		0h	Reserved
222	F	103Fh	Transport major version number
223	F	0h	Transport minor version number
224-229		0h	reserved
230-233		0h	Extend number of user addressable sectors
234		0001h	Minimum number of 512-byte data blocks per DOWNLOAD MICROCODE command for mode 03h
235		00FFh	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)

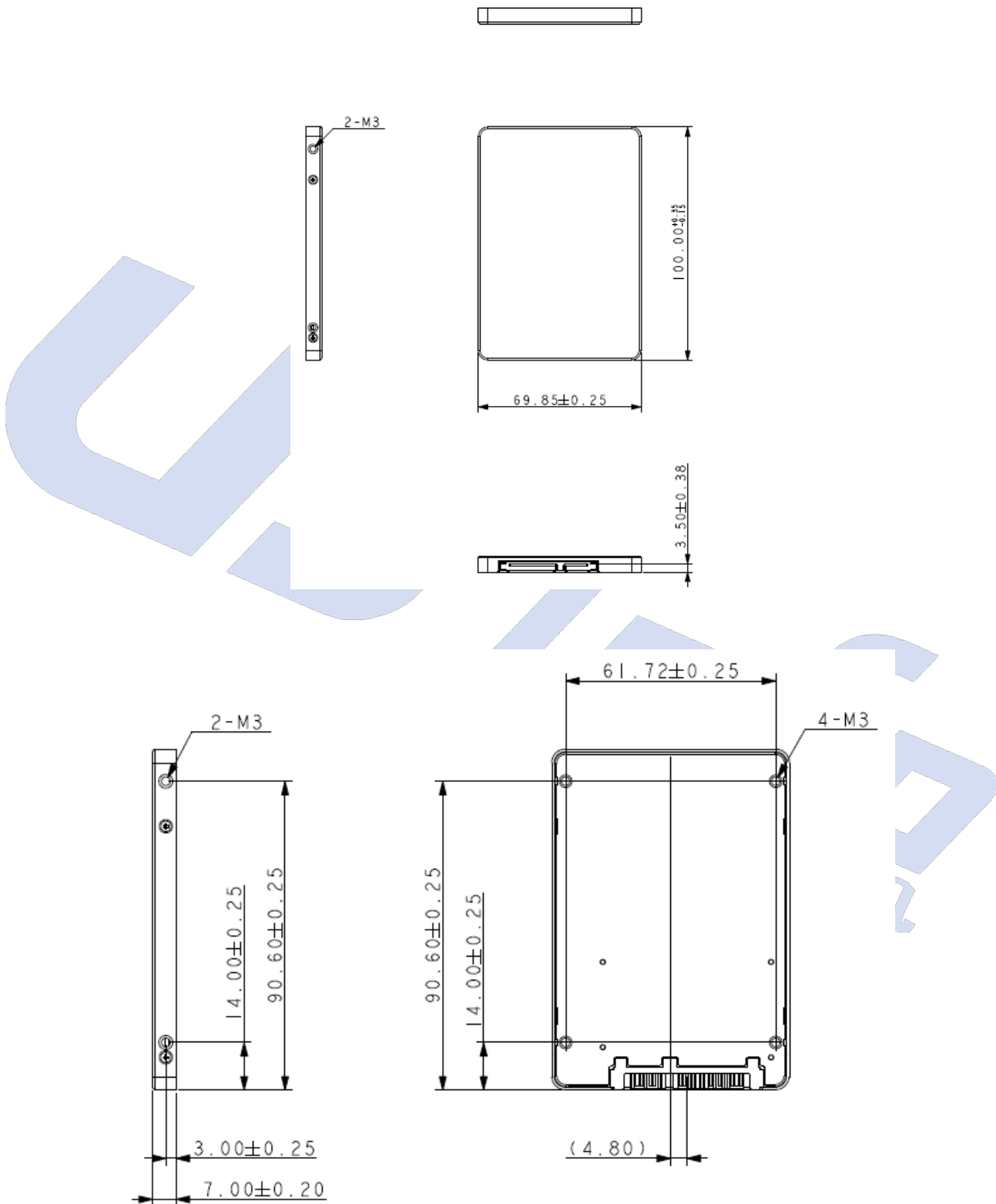
■ List of Device Identification for Each Capacity

Capacity (GB)	*1 (Word 1/Word 54)	*2 (Word 57-58)	*3 (Word 60-61)	*4 (Word 100-103)
8	3CA5h	EEC9B0h	EEC9B0h	EEC9B0h
16	3FFFh	FBFC10h	1DD40B0h	1DD40B0h
32	3FFFh	FBFC10h	3BA2EB0h	3BA2EB0h
64	3FFFh	FBFC10h	7740AB0h	7740AB0h
128	3FFFh	FBFC10h	EE7C2B0h	EE7C2B0h
256	3FFFh	FBFC10h	0FFFFFFFh	1DCF32B0h
512	3FFFh	FBFC10h	0FFFFFFFh	3B9E12B0h
1024	3FFFh	FBFC10h	0FFFFFFFh	6FC81AB0h

7. PHYSICAL DIMENSION



Dimension: 100.10mm(L) x 69.85mm(W) x 7.00mm(H)



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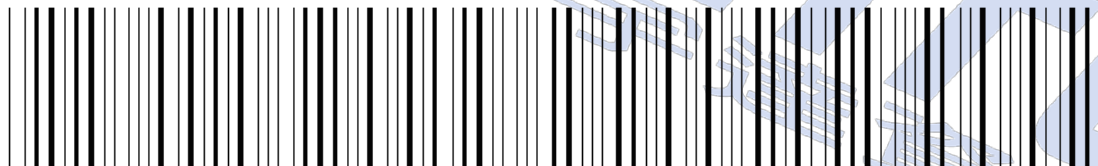
8. TERMINOLOGY



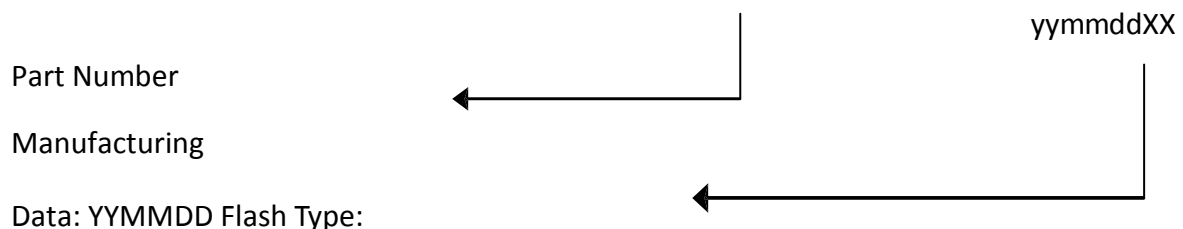
The following table is to list out the acronyms that have been applied throughout the document.

Term	Definitions
ATTO	Commercial performance benchmark application
DDR	Double data rate (SDRAM)
DIPM	Device initiated power management
HIPM	Host initiated power management
LBA	Logical block addressing
MB	Mega-byte
MTBF	Mean time between failures
NCQ	Native command queue
SATA	Serial advanced technology attachment
S.M.A.R.T.	Self-monitoring, analysis and reporting technology
SSD	Solid state disk

9. BARCODE DESCRIPTION



H F 3 2 5 U D 0 0 1 T B C 8 P



10. PARTNUMBER DECODER



HF3-25UDX⁸X⁹X¹⁰X¹¹X¹²X¹³X¹⁴X¹⁵X¹⁶X¹⁷

X ¹ X ² X ³	X ⁴ X ⁵	X ⁶ X ⁷	X ⁸ X ⁹ X ¹⁰ X ¹¹ X ¹²	X ¹³	X ¹⁴	X ¹⁵	X ¹⁶ X ¹⁷
HF3	25	UD	008GB 128GB 016GB 256GB 032GB 512GB 064GB 001TB	C: SLC Standard (0°C ~ +70°C) I: SLC Industrial (-40°C ~ +85°C) K: MLC Standard (0°C ~ +70°C) M: MLC Industrial (-40°C ~ +85°C) P: pSLC Standard (0°C ~ +70°C) F: pSLC Industrial (-40°C ~ +85°C)	4: 4-channel 8: 8-channel	P	blank

