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HDD

Product image may represent a design model.

MG04ACA SERIES
ENTERPRISE CAPACITY HDD

The MG04ACA Enterprise Capacity HDD models provide capacities up to 6 TB[1] and 7,200 rpm performance, in a robust design engineered for nearline business-critical workloads.

The MG04ACA series utilizes industry-standard 3.5-inch[2] 26.1mm height form factor and Advanced Format sector technologies for optimum capacity and data reliability. 512e models support Toshiba Persistent Write Cache[3] technology which helps enhance performance with handling data in the event of a sudden loss of power. Equipped with SATA 6.0 Gbit/s[4] interface, the Enterprise Capacity MG04ACA models help save rack space and reduce the footprint and operational burden of business critical servers and storage systems.

512e or 4Kn Advanced Format sector technology models are available. 4Kn models (MG04ACAxxxA) offer optimum performance and compatibility with the 4K applications and operating environments. 512e models (MG04ACAxxxE) provide support for legacy applications and operating environments that require 512B sector lengths.

KEY FEATURES

- Industry Standard 3.5-inch 26.1 mm Height Form Factor
- Large-Capacity (6 / 5 / 4 / 3 / 2 TB models)
- 7,200 rpm Performance
- SATA 6.0 Gbit/s Interface
- 550 Total TB Transferred per Year Workload Rating
- 512e or 4Kn Advanced Format Sector Technology
- (512e Model and 6TB Model) Introducing Toshiba Persistent Write Cache Technology with PLP[5] for Data-Loss Protection in Sudden Power-Loss Events

APPLICATIONS

- Engineered for Mid-line / Nearline Business Critical Workloads
- Tier 2 Business-Critical Servers and Storage Systems
- Servers Supporting Application Workloads that Benefit from High Capacity per Spindle
- Capacity-Optimized Data Center Storage Systems

SPECIFICATIONS (TABLE 1)

Model Number		MG04ACA600A MG04ACA600E	MG04ACA500A MG04ACA500E	MG04ACA50DA MG04ACA50DE
Interface		SATA-2.6/3.0 (1.5Gbit/s, 3.0Gbit/s, 6.0Gbit/s)		
Formatted Capacity		6 TB	5 TB	5 TB
Performance	Interface Speed	6.0 Gbit/s Max.		
	Rotation Speed	7,200 rpm		
	Average Latency Time	4.17 ms		
	Buffer Size	128 MiB[6]		
	Internal Transfer Speed (Max.)	205 MiB/s		
Logical Data Block Length	MG04ACAxxxA	HOST: 4,096 B / DISK: 4,096 B		
	MG04ACAxxxE (Emulation)	HOST: 512 B / DISK: 4,096 B		
Supply Voltage	Allowable Voltage	12 V + 5% / 5 V + 5% [7]		
Power Consumption	Read / Write	11.3 W		
	Low Power Idle	6.0 W Typ		
Acoustics (Sound Power)	Idle	34 dB Ave.	31 dB Ave.	34 dB Ave.
	Random Seek	35 dB Ave.	34 dB Ave.	35 dB Ave.

SPECIFICATIONS (TABLE 2)

Model Number		MG04ACA400A MG04ACA400E	MG04ACA300A MG04ACA300E	MG04ACA200A MG04ACA200E
Interface		SATA-2.6/3.0 (1.5Gbit/s, 3.0Gbit/s, 6.0Gbit/s)		
Formatted Capacity		4 TB	3 TB	2 TB
Performance	Interface Speed	6.0 Gbit/s Max.		
	Rotation Speed	7,200 rpm		
	Average Latency Time	4.17 ms		
	Buffer Size	128 MiB[6]		
	Internal Transfer Speed (Max.)	185 MiB/s		175 MiB/s
Logical Data Block Length	MG04ACAxxxA	HOST: 4,096 B / DISK: 4,096 B		
	MG04ACAxxxE (Emulation)	HOST: 512 B / DISK: 4,096 B		
Supply Voltage	Allowable Voltage	12 V + 5% / 5 V + 5%[7]		
Power Consumption	Read / Write	11.3 W		
	Low Power Idle	6.0 W Typ.		
Acoustics (Sound Power)	Idle	31 dB Ave.	31 dB Ave.	31 dB Ave.
	Random Seek	34 dB Ave.	34 dB Ave.	34 dB Ave.

[1] Definition of capacity: Toshiba defines a megabyte (MB) as 1,000,000 bytes, a gigabyte (GB) as 1,000,000,000 bytes and a terabyte (TB) as 1,000,000,000,000 bytes. A computer operating system, however, reports storage capacity using powers of 2 for the definition of 1GB = 230 = 1,073,741,824 bytes and therefore shows less storage capacity. Available storage capacity (including examples of various media files) will vary based on file size, formatting, settings, software and operating system, such as Microsoft Operating System and/or pre-installed software applications, or media content. Actual formatted capacity may vary.
[2] "2.5-inch" and "3.5-inch" mean the form factor of HDDs or SSDs. They do not indicate drive's physical size.
[3] PWC with PLP is a function to handle the write data that the drive reports "Normal completion" to the host but not being stored to hard disk media yet. The write data may be written to the commanded LBA on the hard disk media. The un-written data to hard disk media is stored to Flash memory using back up power by PLP when the power supply to the drive suddenly is shut down. And, after PLP operation, it may be required more time to start up the drive than in case of normal shutdown. 1) PLP does not secure data in the mode of all the power shutdowns. When power supplies other than recommended procedure are intercepted, data might be lost. 2) In the power shutdown before it reports on the Write completion, data not anticipated might be lost.
[4] Read and write speed may vary depending on the host device, read and write conditions, and file size.
[5] PLP supports to record data in buffer memory to hard disk media utilizing back electromotive force along with media rotation inertia in case of sudden supply shut down.
[6] A kibibyte (KiB) means 2^{10}, or 1,024 bytes, a mebibyte (MiB) means 2^{20}, or 1,048,576 bytes, and a gibibyte (GiB) means 2^{30}, or 1,073,471,824 bytes.
[7] Make sure the value is not less than -0.3V DC (less than -0.6V, 0.1ms) when turning on or off the power.

ENVIRONMENTAL LIMITS

Item		Specification
Temperature	Operating[8]	5 °C to 55 °C
	Non-Operating	- 40 °C to 70 °C
	Gradient	20 °C/h or less
Humidity	Operating	5 % to 90 % R.H. (No condensation)
	Non-Operating	5 % to 95 % R.H. (No condensation)
Shock	Operating	686 m/s^2 {70 G} (2 ms duration)
	Non-Operating	2,940 m/s^2 {300 G} (2 ms duration)
Vibration	Operating	7.35 m/s^2 {0.75 G} (5 to 300Hz) 2.45 m/s^2 {0.25 G} (300 to 500Hz)
	Non-Operating	49 m/s^2 {5 G} (5 to- 500Hz)
Altitude	Operating	- 305 m to +3,048 m {-1,000 to +10,000 feet}
	Non-Operating	- 305 m to +12,192 m {-1,000 to +40,000 feet}

ENVIRONMENTAL FEATURE

Model Number	MG04ACAxxxA / MG04ACAxxxE MG04ACA50DA / MG04ACA50DE
RoHS[9]	Compatible
Halogen free[10]	Yes
Antimony free[10]	Yes

[8] The temperature of the enclosure surface must be kept under 60 °C at any moment.
[9] Toshiba Semiconductor & Storage Products Company defines "RoHS-Compatible" products as products that either (i) contain no more than a maximum concentration value of 0.1% by weight in Homogeneous Materials for lead, mercury, hexavalent chromium, polybrominated biphenyls (PBBs) and polybrominated diphenyl ethers (PBDEs) and of 0.01% by weight in Homogeneous Materials for cadmium; or (ii) fall within any of the application exemptions set forth in the Annex to the RoHS Directive (Directive 2011/65/EC of the European Parliament and of the Council of 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment). "Homogeneous Material" means a material of uniform composition that cannot be mechanically disjointed (meaning separated, in principle, by mechanical actions such as unscrewing, cutting, crushing, grinding and/or abrasive processes) into different materials. Examples of "Homogeneous Materials" would be individual types of plastics, ceramics, glass, metals, alloys, paper, board, resins and coatings.
[10] Toshiba Semiconductor & Storage Products Company defines halogen-free and antimony-free SSD and HDD products as those meeting all of the following requirements: (a) containing bromine (Br) and chlorine (Cl) at no more than 900 parts per million (ppm) by weight for each element, and containing bromine and chlorine in an aggregate amount not exceeding 1500 ppm by weight; and (b) containing no more than 1000 ppm antimony (Sb) by weight. For the avoidance of doubt, Halogen-Free/Antimony-Free SSD or HDD products may not be entirely free of bromine, chlorine, or antimony, and may contain other element of the halogen family.

RELIABILITY

Model Number	MG04ACAxxxA / MG04ACAxxxE MG04ACA50DA / MG04ACA50DE
MTTF [11]	1,400,000 hours
AFR (Annual Failure Rate)	0.626 %
Non-recoverable Error Rate	10 error per 10^{16} bits read
Load / Unload	600,000 times (Max.)
Availability	24 hours/day, 7 days/week
Rated Annual Workload (Total TB Transferred per Year, R/W)	550 TB/year
POH (Power On Hours per Year)[12]	8,760 hours

MODEL NUMBERS

Model Number	Interface	Formatted Capacity	Sector Format
MG04ACA600A	SATA-2.6/3.0	6 TB	4Kn
MG04ACA500A	SATA-2.6/3.0	5 TB	4Kn
MG04ACA50DA	SATA-2.6/3.0	5 TB	4Kn
MG04ACA400A	SATA-2.6/3.0	4 TB	4Kn
MG04ACA300A	SATA-2.6/3.0	3 TB	4Kn
MG04ACA200A	SATA-2.6/3.0	2 TB	4Kn
MG04ACA600E	SATA-2.6/3.0	6 TB	512e
MG04ACA500E	SATA-2.6/3.0	5 TB	512e
MG04ACA50DE	SATA-2.6/3.0	5 TB	512e
MG04ACA400E	SATA-2.6/3.0	4 TB	512e
MG04ACA300E	SATA-2.6/3.0	3 TB	512e
MG04ACA200E	SATA-2.6/3.0	2 TB	512e

[11] MTTF (Mean Time to Failure) is not a guarantee or estimate of product life; it is a statistical value related to mean failure rates for a large number of products which may not accurately reflect actual operation. Actual operating life of the product may be different from the MTTF.
[12] POH: 24 hours/day, 7 days/week, average HDA surface temperature: 40°C or less, workload: up to 550 TB/year, which is defined as the amount of data written, read or verified by commands from host system

SAFETY / EMI STANDARDS

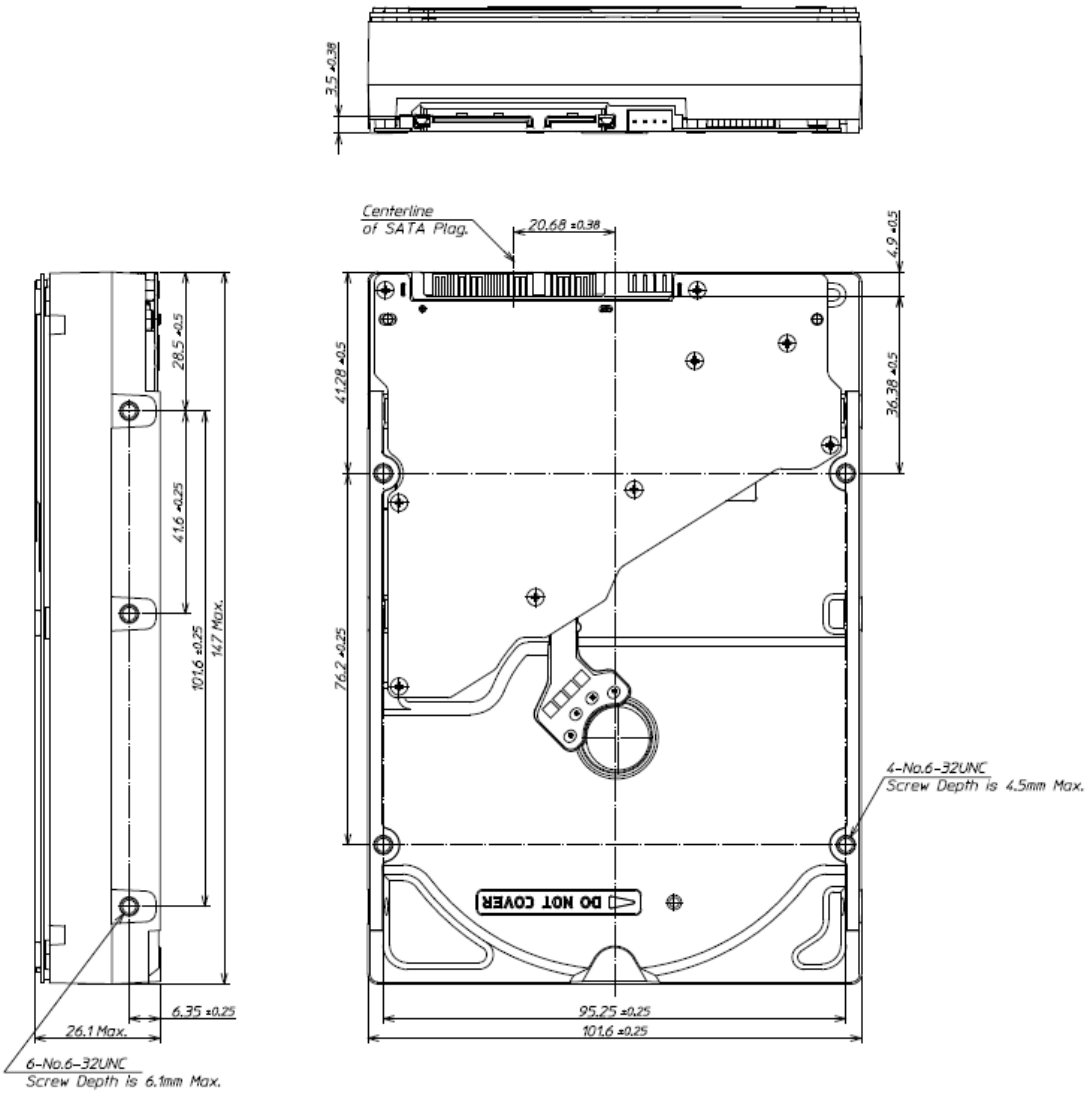
Title	Description	Region
UL (Underwriters Laboratories)	UL 60950-1, 2nd Edition, 2011-12-19	USA
CSA (Canadian Standard Association)	CAN/CSA-C22.2 No.60950-1-07 2nd Edition.	Canada
TÜV (Technischer Überwachungs Verein)	EN 60950-1:2006+A11+A1+A12	Germany
BSMI (Bureau of Standards, Metrology and Inspection)	CNS 13438 (CISPR Pub. 22 Class B):D33003	Taiwan
MSIP (Ministry of Science, ICT & Future Planning)	電磁波障害防止基準 KN22, KN24 (CISPR Pub. 22 Class B) (Note)	Korea
ACMA (Australian Communications and Media Authority)	AS/NZS CISPR22	Australia

(Note) Marks of KC	MG04ACA600E
Made in Japan	1. 기기의 명칭(모델명) : MG04ACA600E 2. 인증번호 : MSIP-REM-TSD-MG04ACP600E 3. 인증받은 자의 상호 : TOSHIBA CORPORATION 4. 제조년월일 : 2014-10 5. 제조자 / 제조국가 : TOSHIBA CORPORATION / 일본
Made in Philippines	1. 기기의 명칭(모델명) : MG04ACA600E 2. 인증번호 : MSIP-REM-TSD-MG04ACP600E 3. 인증받은 자의 상호 : TOSHIBA CORPORATION 4. 제조년월일 : 2014-10 5. 제조자 / 제조국가 : TOSHIBA CORPORATION / 필리핀

(Note) Marks of KC	MG04ACA500E
Made in Japan	1. 기기의 명칭(모델명) : MG04ACA500E 2. 인증번호 : MSIP-REM-TSD-MG04ACP500E 3. 인증받은 자의 상호 : TOSHIBA CORPORATION 4. 제조년월일 : 2013-10 5. 제조자 / 제조국가 : TOSHIBA CORPORATION / 일본
Made in Philippines	1. 기기의 명칭(모델명) : MG04ACA500E 2. 인증번호 : MSIP-REM-TSD-MG04ACP500E 3. 인증받은 자의 상호 : TOSHIBA CORPORATION 4. 제조년월일 : 2013-10 5. 제조자 / 제조국가 : TOSHIBA CORPORATION / 필리핀

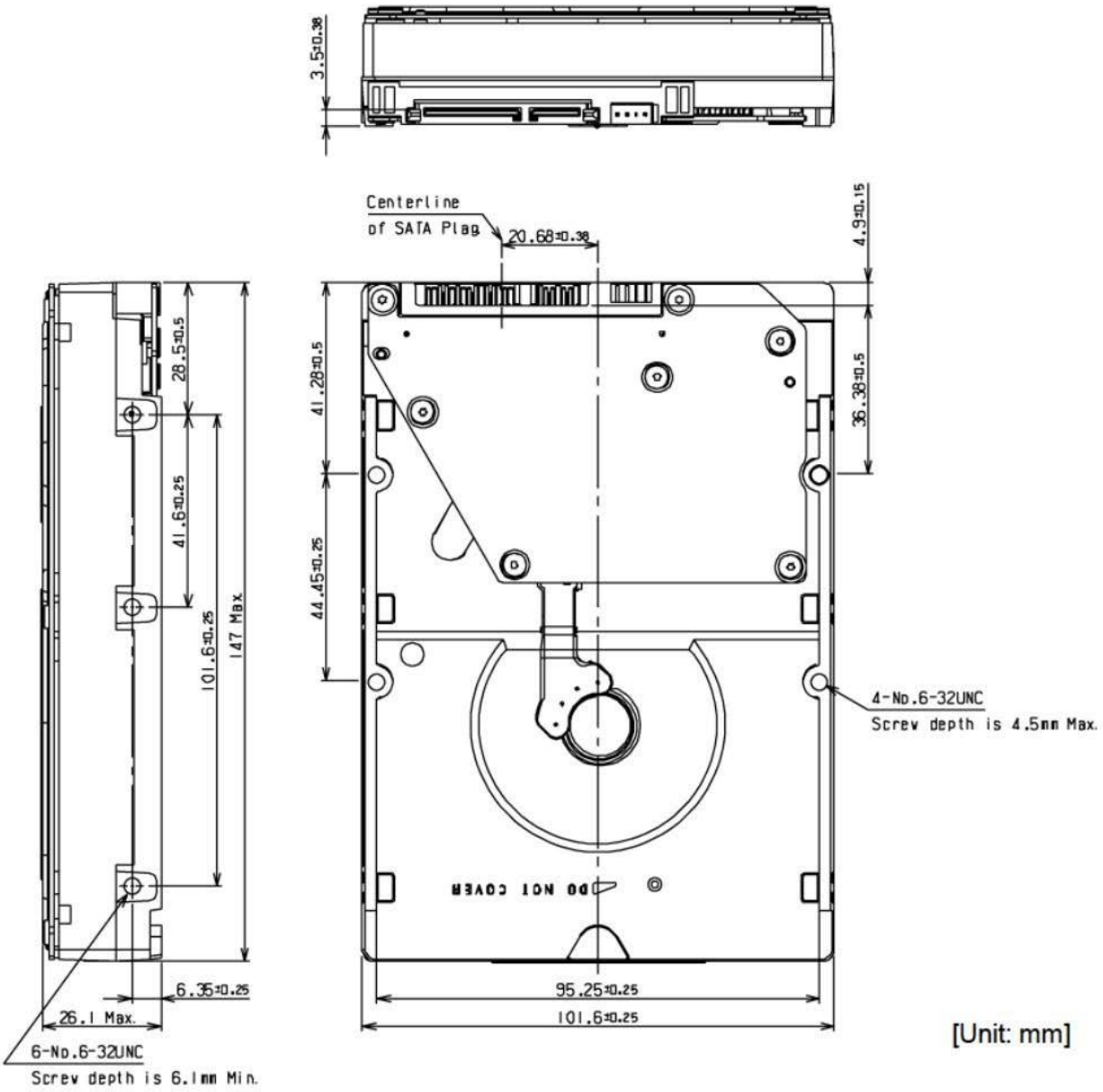
MECHANICAL SPECIFICATIONS

Model Number	MG04ACA600A / MG04ACA600E MG04ACA50DA / MG04ACA50DE
Width	101.6 mm ±0.25 mm
Height	26.1 mm Max.
Length	147 mm Max.
Weight	770 g Max.

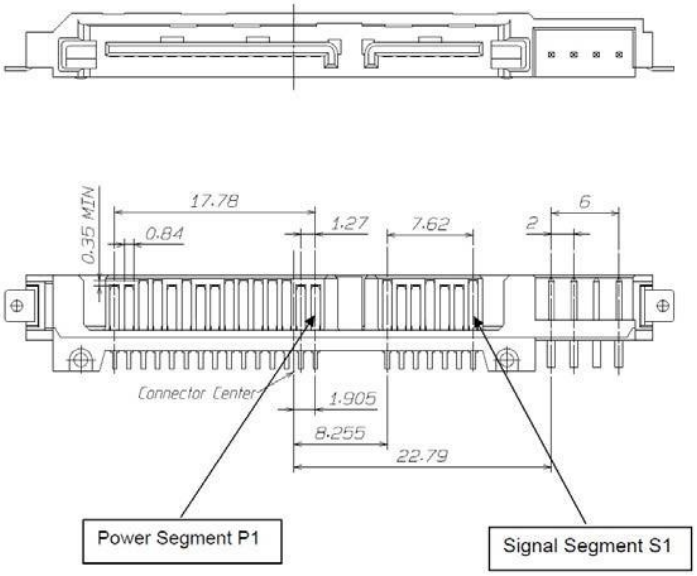


[Unit: mm]

Model Number	MG04ACA500A / MG04ACA500E MG04ACA400A / MG04ACA400E MG04ACA300A / MG04ACA300E MG04ACA200A / MG04ACA200E
Width	101.6 mm ±0.25 mm
Height	26.1 mm Max.
Length	147 mm Max.
Weight	720 g Max.



INTERFACE CONNECTOR



Interface Connector (SATA Plug) Signal Allocation: CN1			
Signal Segment	S1	GND	2nd Mate
	S2	A+	Differential Pair A from PHY
	S3	A-	
	S4	GND	2nd Mate
	S5	B-	Differential Pair B from PHY
	S6	B+	
	S7	GND	2nd Mate
Signal Segment "L"			
Central Connector Polarizer			
Power Segment "L"			
Power Segment	P1	V33	3.3 V Power (Unused)
	P2	V33	3.3 V Power (Unused)
	P3	V33	3.3 V Power Pre-Charge 2nd Mate (Unused)
	P4	GND	1st Mate
	P5	GND	2nd Mate
	P6	GND	2nd Mate
	P7	V5	5 V Power Pre-Charge 2nd Mate
	P8	V5	5 V Power
	P9	V5	5 V Power
	P10	GND	2nd Mate
	P11[13]	Spin/ACT	-Staggered Spin-up Mode Detect (Input) -Activity LED Drive (Output)
	P12	GND	1st Mate
	P13	V12	12 V Power Pre-Charge 2nd Mate
	P14	V12	12 V Power
	P15	V12	12 V Power
Power Segment Key			

[13] Reference 3.3.3.1 Power Segment Pin 11 of the MG04ACA Product Specification.
Notice: This drive uses 5V and 12V power. 3.3V power is not used.
HDA (Head Disk Assembly) and DC ground (ground pins on interface) are connected electrically each other.

COMMAND TABLE (Part 1)

Op-Code	Command Name
E5h/98h	CHECK POWER MODE
B1h	DEVICE CONFIGURATION
92h	DOWNLOAD MICROCODE
90h	EXECUTE DIAGNOSTICS
E7h	FLUSH CACHE
EAh	FLUSH CACHE EXT
ECh	IDENTIFY DEVICE
E3h/97h	IDLE
E1h/95h	IDLE IMMDIATE
91h	INITIALIZE DEVICE PARAMETERS
00h	NOP
E4h	READ BUFFER
C8h	READ DMA
25h	READ DMA EXT
60h	READ FPDMA QUEUED
2Fh	READ LOG EXT
47h	READ LOG DMA EXT
C4h	READ MULTIPLE
29h	READ MULTIPLE EXT
F8h	READ NATIVE MAX ADDRESS
27h	READ NATIVE MAX ADDRESS EXT
20h	READ SECTOR(S)
24h	READ SECTOR(S) EXT
40h	READ VERIFY SECTOR(S)
42h	READ VERIFY SECTOR(S) EXT

COMMAND TABLE (Part 2)

Op-Code	Command Name
1xh	RECALIBRATE
F1h	SECURITY SET PASSWORD
F2h	SECURITY UNLOCK
F3h	SECURITY ERASE PREPARE
F4h	SECURITY ERASE UNIT
F5h	SECURITY FREEZE LOCK
F6h	SECURITY DISABLE PASSWORD
7xh	SEEK
EFh	SET FEATURES
F9h	SET MAX
37h	SET MAX ADDRESS EXT
C6h	SET MULTIPLE MODE
E6h/99h	SLEEP
B0h	SMART Function Set
E2h/96h	STANDBY
E0h/94h	STANDBY IMMEDIATE
E8h	WRITE BUFFER
CAh	WRITE DMA
35h	WRITE DMA EXT
3Dh	WRITE DMA FUA EXT
61h	WRITE FPDMA QUEUED
3Fh	WRITE LOG EXT
57h	WRITE LOG DMA EXT
C5h	WRITE MULTIPLE
39h	WRITE MULTIPLE EXT
CEh	WRITE MULTIPLE FUA EXT
30h	WRITE SECTOR(S)
34h	WRITE SECTOR(S) EXT
45h	WRITE UNCORRECTABLE EXT
3Ch	WRITE VERIFY

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