

MG10F SERIES

CLOUD-SCALE CAPACITY HDD

The MG10F Series provides 22 TB ^[1] of conventional magnetic recording (CMR) capacity. The drive feature a 550 TB per year workload rating with 7200 rpm performance in a 10-disk helium-sealed, industry-standard 3.5-inch^[2] form factor. The MG10F integrates easily into existing drive bays to help reduce the footprint and operational burden of cloud-scale storage infrastructure. The MG10F supports File, Object and Block storage making it an excellent choice for business critical servers and storage systems. The MG10F Series delivers optimum storage capacity and application compatibility, with unsurpassed data reliability.



Product image may represent a design model.

KEY FEATURES

- 22 / 20 TB capacity
- Conventional Magnetic Recording (CMR) for broad compatibility
- Industry-leading 10-disk helium-sealed design for superior storage density
- Industry Standard 3.5-inch 26.1 mm height Form Factor
- 7200 rpm Performance
- Lower operational power profile, providing excellent power efficiency (W/TB) for better TCO
- 550 Total TB Transferred per Year Workload Rating ^[4]
- Toshiba Persistent Write Cache Technology for Data-Loss Protection in Sudden Power-Loss Events
- Sanitize Instant Erase (SIE) option model and Self Encrypting Drive (SED) option model ^[5]
- Support FFMT (Fast Format) for SAS

APPLICATIONS

- Cloud-scale Server and Storage Infrastructure
- Tiered Storage Infrastructure Solutions
- Scale-out File and Object Storage Infrastructure
- Distributed files systems
- OLTP(Online Transaction Processing) and HPC (High Performance Computing) applications
- High Capacity RAID storage
- Secure Enterprise Backup and Restore
- Data Retention and Compliance Data Archives
- Data Analytics
- Centralized Surveillance

SPECIFICATION

Item		MG10AFA22T	MG10AFA20T
Interface		SATA-3.3	
Formatted Capacity		22 TB	20 TB
Performance	Interface Speed ^[3]	6.0 Gbit/s, 3.0 Gbit/s, 1.5 Gbit/s	
	Rotation Speed	7200 rpm	
	Buffer Size ^[7]	512 MiB	
	Maximum Sustained Data Transfer Speed ^[6] (Typ.)	271 MiB/s	
Logical Data Block Length	MG10AFxxxE/EY ^[8]	HOST 512 B, DISK 4096 B	
	MG10AFPxxxE ^[8]		
Supply Voltage	Allowable Voltage	12 V ^[9] ±10 % / 5 V ^[9] +10 % / -7 % ^[10]	
Power Consumption	Write / Read (4KB Q1) (Typ.)	8.38 W	
	Active Idle (Typ.)	4.35 W	
Acoustics ^[11] (Sound Power)	Idle (Typ.)	20 dB	
	Seek (Typ.)	32 dB	

Item		MG10SFA22T	MG10SFA20T
Interface		SAS-3.0	
Formatted Capacity		22 TB	20 TB
Performance	Interface Speed ^[3]	12.0 Gbit/s, 6.0 Gbit/s, 3.0 Gbit/s, 1.5 Gbit/s	
	Rotation Speed	7200 rpm	
	Buffer Size ^[7]	512 MiB	
	Maximum Sustained Data Transfer Speed ^[6] (Typ.)	271 MiB/s	
Logical Data Block Length	MG10SFAxxxE/EY ^[8]	HOST 512 B, DISK 4096 B HOST 520 B, DISK 4160 B HOST 528 B, DISK 4224 B	
	MG10SFPxxxE ^[8]		
Supply Voltage	Allowable Voltage	12 V ^[9] ±10 % / 5 V ^[9] +10 % / -7 % ^[10]	
Power Consumption	Write / Read (4KB Q1) (Typ.)	8.86 W	
	Active Idle (Typ.)	4.82 W	
Acoustics ^[11] (Sound Power)	Idle (Typ.)	20 dB	
	Seek (typ.)	32 dB	

ENVIRONMENTAL LIMITS

Item		Specification
Ambient Temperature	Operating	5 °C to 55 °C (No condensation)
	Non-Operating ^{[12][13]}	-40 °C to 70 °C (No condensation)
Enclosure surface temperature	Operating	5 °C to 60 °C (No condensation)
Relative Humidity	Operating	5 % to 90 % R.H. (No condensation)
	Non-Operating	5 % to 95 % R.H. (No condensation)
Altitude	Operating	-305 m to +3048 m
	Non-Operating ^{[12][13]}	-305 m to +12 192 m
Shock ^[14]	Operating	490 m/s ² { 50 G } (2 ms duration)
	Non-Operating	1960 m/s ² { 200 G } (2 ms duration)
Vibration ^[14]	Operating ^[15]	7.35 m/s ² { 0.75 G } (5 to 300 Hz) 2.45 m/s ² { 0.25 G } (300 to 500 Hz)
	Non-Operating ^[16]	29.4 m/s ² { 3.0 G } (5 to 500 Hz)

RELIABILITY

Item	Specification
MTTF / MTBF (AFR) ^[17]	2 500 000 hours (0.35 %)
Non-recoverable Error Rate	10 per 10 ¹⁶ bits read
Load / Unload	600 000 times
Availability	24 hours/day, 7 days/week
Rated Annual Workload	550 TB per year

[1] Definition of capacity: Toshiba defines 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 1TB = 2⁴⁰ = 1 099 511 627 776 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] "3.5-inch" mean the form factor of HDDs. They do not indicate drive's physical size.

[3] Read and write speed may vary depending on the host device, read and write conditions, and file size.

[4] Workload is defined as the amount of data written, read or verified by commands from host system.

[5] SED supports TCG Enterprise SSCs. And the HDDs which have any security function may not be available in the countries where the use of such HDDs is prohibited or limited due to export control and local regulations.

[6] The maximum sustained data rate and interface speed may be restricted to the response speed of host system and by transmission characteristics. 1 Gbit/s = 1 000 000 000 bits/s. 1 MiB/s = 1 048 576 bytes/s

[7] A mebibyte (MiB) means 2²⁰, or 1 048 576 bytes.

[8] Read-modify-write is supported.

[9] Input voltages are specified at the HDD connector side, during HDD ready state.

[10] Make sure the value is not less than -0.3 V DC (less than -0.6 V, 0.1 ms) when turning on or off the power.

[11] The measuring method is based on ISO 7779.

[12] Non-operating condition (except storage condition) assumes short term transportation.

[13] The range of altitude is 3048 m or less. Up to 55 °C at 7620 m. Up to 40 °C at 12 192 m.

[14] Vibration applied to the HDD is measured at near the mounting screw hole on the frame as much as possible.

[15] At random seek write/read and default on retry setting with log sweep vibration.

[16] At power-off state after installation

[17] MTTF / MTBF (Mean Time to Failure / Mean Time Between Failure) of the HDDs during its life time is 2 500 000 hours and AFR (Annualized Failure Rate) is 0.35 %. (POH: 8760 hours per one year (24 hours per one day, 7 days per one week). Average HDA surface temperature: 40 °C or less, workloads: 550 TB per one year, which is defined as the amount of data written, read or verified by commands from host system). Continual or sustained operation at case HDA surface temperature above 40 °C may degrade product reliability.

MODEL NUMBER

Model Number	Interface	Capacity	Sector Format *	Optional Security
MG10AFA22TE	SATA-3.3	22 TB	512e	
MG10AFA20TE	SATA-3.3	20 TB	512e	
MG10AFA22TEY	SATA-3.3	22 TB	512e	SIE
MG10AFA20TEY	SATA-3.3	20 TB	512e	SIE
MG10AFP22TE	SATA-3.3	22 TB	512e	SED
MG10AFP20TE	SATA-3.3	20 TB	512e	SED

* Default configuration is 512e. Convert between 512 and 4096 byte logical size formats.

Model Number	Interface	Capacity	Sector Format *	Optional Security
MG10SFA22TE	SAS-3.0	22 TB	512e	
MG10SFA20TE	SAS-3.0	20 TB	512e	
MG10SFA22TEY	SAS-3.0	22 TB	512e	SIE
MG10SFA20TEY	SAS-3.0	20 TB	512e	SIE
MG10SFP22TE	SAS-3.0	22 TB	512e	SED
MG10SFP20TE	SAS-3.0	20 TB	512e	SED

* Default configuration is 512e. Convert between 512 and 4096 byte logical size formats.

MARKING

1) WEEE

Following information is only for EU-member states:

The use of the symbol indicates that this product may not be treated as household waste. By ensuring this product is disposed of correctly, you will help prevent potential negative consequences for the environment and human health, which could otherwise be caused by inappropriate waste handling of this product. For more detailed information about recycling of this product, please contact your local city office, your household waste disposal service or the shop where you purchased the product.



2) Names and Contents of Hazardous Substances or Elements in Products

产品中有害物质的名称及含量

部件名称	有害物质					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
HDD(硬盘驱动器)	×	○	○	○	○	○

本表格依据 SJ/T 11364 的规定编制。
○：表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。
×：表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求。



中华人民共和国环保使用期限

SAFETY / EMI STANDARDS

Item
UL (Underwriters Laboratories)
CSA (Canadian Standard Association)
TÜV (Technischer Überwachungs Verein)
BSMI (Bureau of Standards, Metrology and Inspection)
KC (Korea Certification)
RCM (Regulatory Compliance Mark)

(Note) Marks of KC	
Made in Japan	 <ul style="list-style-type: none"> 1. 기기의 명칭(모델명): MG10AFA22T/20TE 2. 인증번호: R-R-T48-MG10AFA22TE 3. 인증받은 자의 상호: TOSHIBA ELECTRONIC DEVICES & STORAGE CORPORATION 4. 제조년월일: 2022-09 5. 제조자 / 제조국가: TOSHIBA ELECTRONIC DEVICES & STORAGE CORPORATION / 일본
	 <ul style="list-style-type: none"> 1. 기기의 명칭(모델명): MG10SFA22T/20TE 2. 인증번호: R-R-T48-MG10SFA22TE 3. 인증받은 자의 상호: TOSHIBA ELECTRONIC DEVICES & STORAGE CORPORATION 4. 제조년월일: 2022-09 5. 제조자 / 제조국가: TOSHIBA ELECTRONIC DEVICES & STORAGE CORPORATION / 일본
Made in Philippines	 <ul style="list-style-type: none"> 1. 기기의 명칭(모델명): MG10AFA22T/20TE 2. 인증번호: R-R-T48-MG10AFA22TE 3. 인증받은 자의 상호: TOSHIBA ELECTRONIC DEVICES & STORAGE CORPORATION 4. 제조년월일: 2022-09 5. 제조자 / 제조국가: TOSHIBA ELECTRONIC DEVICES & STORAGE CORPORATION / 필리핀
	 <ul style="list-style-type: none"> 1. 기기의 명칭(모델명): MG10SFA22T/20TE 2. 인증번호: R-R-T48-MG10SFA22TE 3. 인증받은 자의 상호: TOSHIBA ELECTRONIC DEVICES & STORAGE CORPORATION 4. 제조년월일: 2022-09 5. 제조자 / 제조국가: TOSHIBA ELECTRONIC DEVICES & STORAGE CORPORATION / 필리핀

B 급 기기 (가정용 방송통신기자재)	이 기기는 가정용 (B 급) 전자파 적합 기기로서 주로 가정에서 사용하는 것을 목적으로 하며, 모든 지역에서 사용할 수 있습니다.
--------------------------------	--

CE Marking

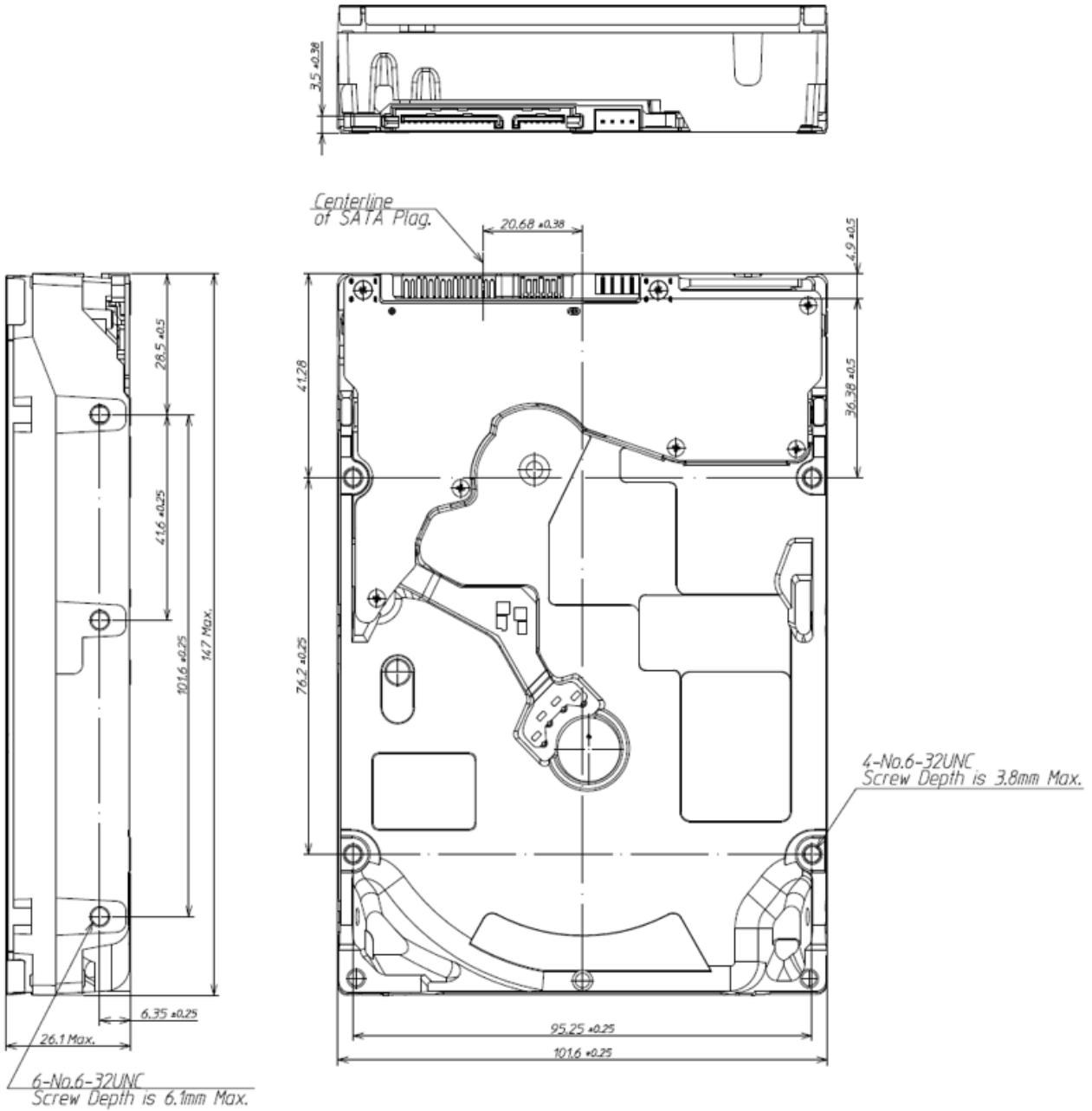
Category	Applied standard	Issued year	Comment
EMC 2014/30/EU	Emission: EN55032	2015	Class B (including domestic environment)
	Immunity: EN55035	2017	Product immunity standard for IT-equipment
RoHS 2011/65/EU	EN IEC63000	2018	Category 3

UKCA Marking

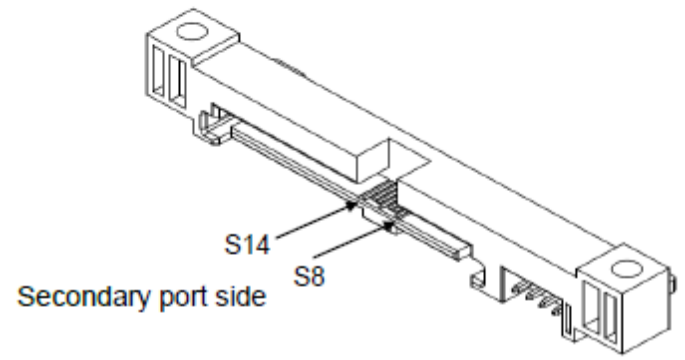
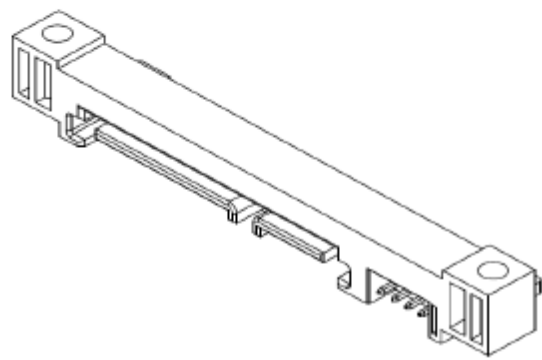
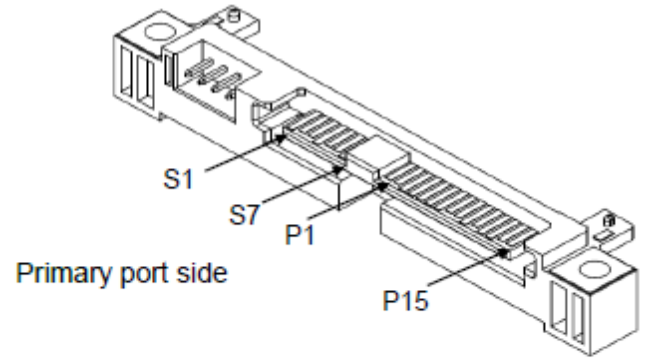
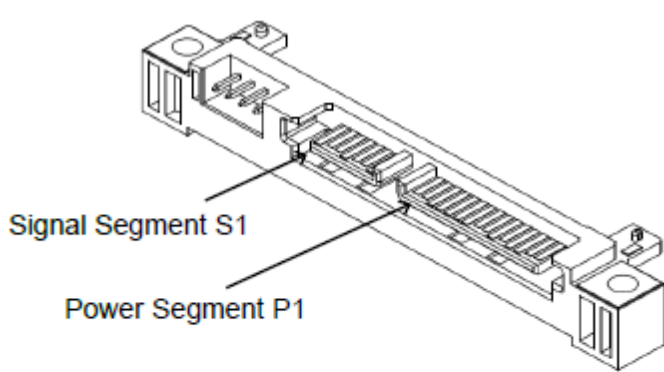
Category	Applied standard	Issued year	Comment
EMC	Emission: BS EN55032	2015	Class B (including domestic environment)
	Immunity: BS EN55035	2017	Product immunity standard for IT-equipment
RoHS	BS EN IEC63000	2018	Category 3

Item	MG10SFA22T	MG10SFA20T
Width (Max)	101.85 mm	
Height (Max)	26.1 mm	
Length (Max)	147.0 mm	
Weight (Max)	720 g	

[Unit: mm]



INTERFACE CONNECTOR



SATA plug connector overview
MG10AFA22T/20T

SAS plug connector overview
MG10SFA22T/20T

INTERFACE CONNECTOR (SATA plug) SIGNAL ALLOCATION

MG10AFA22T/20T

Segment	Pin No.	Pin Definition		
Signal Segment	S1	GND	2 nd Mate	
	S2	A+	Differential Pair A from PHY (Device Rx+)	
	S3	A-	Differential Pair A from PHY (Device Rx-)	
	S4	GND	2 nd Mate	
	S5	B-	Differential Pair B from PHY (Device Tx-)	
	S6	B+	Differential Pair B from PHY (Device Tx+)	
	S7	GND	2 nd Mate	
Power Segment	P1	-	(Unused)	
	P2	-	(Unused)	
	P3	PWDIS	Enter/Exit Power Disable (Option)	
	P4	GND	1 st Mate	
	P5	GND	2 nd Mate	
	P6	GND	2 nd Mate	
	P7	V5	5 V Power Pre-Charge 2 nd Mate	
	P8	V5	5 V Power	
	P9	V5	5 V Power	
	P10	GND	2 nd Mate	
	P11	Spin	Staggered Spin-up Mode Detect (Input)	
		ACT	Activity LED Drive (Output)	
	P12	GND	1 st Mate	
	P13	V12	12 V Power Pre-Charge 2 nd Mate	
	P14	V12	12 V Power	
P15	V12	12 V Power		

Notice: This drive uses 5 V and 12 V power. 3.3 V power is not used.

HDA (Head Disk Assembly) and DC ground (ground pins on interface) are connected electrically each other.

INTERFACE CONNECTOR (SAS plug) SIGNAL ALLOCATION

MG10SFA22T/20T

Segment	Pin No.		Pin Definition
Signal Segment	S1	GND	GND for SAS Primary Port
	S2	RP+	SAS Primary Port Receive (positive) signal
	S3	RP-	SAS Primary Port Receive (negative) signal
	S4	GND	GND for SAS Primary Port
	S5	TP-	SAS Primary Port Transmit (negative) signal
	S6	TP+	SAS Primary Port Transmit (positive) signal
	S7	GND	GND for SAS Primary Port
	S8	GND	GND for SAS Secondary Port
	S9	RS+	SAS Secondary Port Receive (positive) signal
	S10	RS-	SAS Secondary Port Receive (negative) signal
	S11	GND	GND for SAS Secondary Port
	S12	TS-	SAS Secondary Port Transmit (negative) signal
	S13	TS+	SAS Secondary Port Transmit (positive) signal
	S14	GND	GND for SAS Secondary Port

Power Segment	P1 (*1)	Reserved	Do not supply 3.3 V power if POWER DISABLE Function is used.
	P2 (*1)	Reserved	
	P3 (*2)	POWER DISABLE	Power Disable Control input signal
	P4	GND	GROUND
	P5	GND	GROUND
	P6	GND	GROUND
	P7	+5 V-Charge	Pre-charge pin for +5 V
	P8	+5 V	+5 V power supply input
	P9	+5 V	+5 V power supply input
	P10	GND	GROUND
	P11	READY LED	READY LED output
	P12	GND	GROUND
	P13	+12 V-Charge	Pre-charge pin for +12 V
	P14	+12 V	+12 V power supply input
	P15	+12 V	+12 V power supply input

(*1) Do not supply 3.3 V power if POWER DISABLE feature is used.

(*2) The terminal P3 is used as POWER DISABLE control signal in SAS-3. This terminal connects with the GROUND or is an OPENED thing on the host side when the POWER DISABLE function is not used.

SATA COMMAND TABLE (Part 1)

MG10AFA22T/20T

Op-Code	Command Name
78h	ACCESSIBLE MAX ADDRESS CONFIGURATION
E5h / 98h	CHECK POWER MODE
92h / 93h	DOWNLOAD MICROCODE (DMA)
90h	EXECUTE DIAGNOSTICS
E7h	FLUSH CACHE
EAh	FLUSH CACHE EXT
12h	GET PHYSICAL ELEMENT STATUS
ECh	IDENTIFY DEVICE
E3h / 97h	IDLE
E1h / 95h	IDLE IMMEDIATE
91h	INITIALIZE DEVICE PARAMETERS
00h	NOP
E4h	READ BUFFER
C8h	READ DMA
25h	READ DMA EXT
60h	READ FPDMA QUEUED
47h	READ LOG DAM EXT
2Fh	READ LOG EXT
C4h	READ MULTIPLE
29h	READ MULTIPLE EXT
20h	READ SECTOR(s)
24h	READ SECTOR(s) EXT
40h	READ VERIFY SECTOR(s)
42h	READ VERIFY SECTOR(s) EXT

SATA COMMAND TABLE (Part 2)

MG10AFA22T/20T

Op-Code	Command Name
10h	RECALIBRATE
7Ch	REMOVE ELEMENT AND TRUNCATE
0Bh	REQUEST SENSE DATA EXT
B4h	SANITIZE DEVICE
F6h	SECURITY DISABLE PASSWORD
F3h	SECURITY ERASE PREPARE
F4h	SECURITY ERASE UNIT
F5h	SECURITY FREEZE LOCK
F1h	SECURITY SET PASSWORD
F2h	SECURITY UNLOCK
70h	SEEK
77h	SET DATE & TIME EXT
EFh	SET FEATURES
C6h	SET MULTIPLE MODE
B2h	SET SECTOR CONFIGURATION EXT
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
57h	WRITE LOG DMA EXT
3Fh	WRITE LOG 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

SAS COMMAND TABLE (Part 1)

MG10SFA22T/20T

Op-Code	Command Name
00h	TEST UNIT READY
12h	INQUIRY
25h	READ CAPACITY (10)
9Eh / 10h	READ CAPACITY (16)
15h	MODE SELECT (6)
55h	MODE SELECT (10)
1Ah	MODE SENSE (6)
5Ah	MODE SENSE (10)
01h	REZERO UNIT
1Bh	START/STOP UNIT
16h	RESERVE (6)
56h	RESERVE (10)
17h	RELEASE (6)
57h	RELEASE (10)
03h	REQUEST SENSE
4Ch	LOG SELECT
4Dh	LOG SENSE
5Eh	PERSISTENT RESERVE IN
5Fh	PERSISTENT RESERVE OUT
A0h	REPORT LUNS
A3h / 05h	REPORT IDENTIFYING INFORMATION
A4h / 06h	SET IDENTIFYING INFORMATION
A3h / 0Ch	REPORT SUPPORTED OPERATION CODES
A3h / 0Dh	REPORT SUPPORTED TASK MANAGEMENT FUNCTIONS
A3h / 0Fh	REPORT TIMESTAMP
A4h / 0Fh	SET TIMESTAMP

SAS COMMAND TABLE (Part 2)

MG10SFA22T/20T

Op-Code	Command Name
08h	READ (6)
28h	READ (10)
A8h	READ (12)
88h	READ (16)
0Ah	WRITE (6)
2Ah	WRITE (10)
AAh	WRITE (12)
8Ah	WRITE (16)
2Eh	WRITE AND VERIFY (10)
AEh	WRITE AND VERIFY (12)
8Eh	WRITE AND VERIFY (16)
2Fh	VERIFY (10)
AFh	VERIFY (12)
8Fh	VERIFY (16)
0Bh	SEEK (6)
2Bh	SEEK (10)
35h	SYNCHRONIZE CACHE (10)
91h	SYNCHRONIZE CACHE (16)
04h	FORMAT UNIT
07h	REASSIGN BLOCKS
37h	READ DEFECT DATA (10)
B7h	READ DEFECT DATA (12)
1Dh	SEND DIAGNOSTIC
1Ch	RECEIVE DIAGNOSTIC RESULTS
3Bh	WRITE BUFFER
3Ch	READ BUFFER (10)
9Bh	READ BUFFER (16)
3Eh	READ LONG (10)
9Eh / 11h	READ LONG (16)
3Fh	WRITE LONG (10)
9Fh / 11h	WRITE LONG (16)
41h	WRITE SAME (10)
93h	WRITE SAME (16)
48h	SANITIZE (10)
9Eh / 18h	REMOVE ELEMENT AND TRUNCATE (16)
9Eh / 17h	GET PHYSICAL ELEMENT STATUS

RESTRICTIONS ON PRODUCT USE

Toshiba Corporation and its subsidiaries and affiliates are collectively referred to as “TOSHIBA”.

Hardware, software and systems described in this document are collectively referred to as “Product”.

- TOSHIBA reserves the right to make changes to the information in this document and related Product without notice.
- This document and any information herein may not be reproduced without prior written permission from TOSHIBA. Even with TOSHIBA's written permission, reproduction is permissible only if reproduction is without alteration/omission.
- Though TOSHIBA works continually to improve Product's quality and reliability, Product can malfunction or fail. Customers are responsible for complying with safety standards and for providing adequate designs and safeguards for their hardware, software and systems which minimize risk and avoid situations in which a malfunction or failure of Product could cause loss of human life, bodily injury or damage to property, including data loss or corruption. Before customers use the Product, create designs including the Product, or incorporate the Product into their own applications, customers must also refer to and comply with (a) the latest versions of all relevant TOSHIBA information, including without limitation, this document, the specifications, the data sheets and application notes for Product and the precautions and conditions set forth in the "TOSHIBA Semiconductor Reliability Handbook" and (b) the instructions for the application with which the Product will be used with or for. Customers are solely responsible for all aspects of their own product design or applications, including but not limited to (a) determining the appropriateness of the use of this Product in such design or applications; (b) evaluating and determining the applicability of any information contained in this document, or in charts, diagrams, programs, algorithms, sample application circuits, or any other referenced documents; and (c) validating all operating parameters for such designs and applications. **TOSHIBA ASSUMES NO LIABILITY FOR CUSTOMERS' PRODUCT DESIGN OR APPLICATIONS.**
- **PRODUCT IS NEITHER INTENDED NOR WARRANTED FOR USE IN EQUIPMENTS OR SYSTEMS THAT REQUIRE EXTRAORDINARILY HIGH LEVELS OF QUALITY AND/OR RELIABILITY, AND/OR A MALFUNCTION OR FAILURE OF WHICH MAY CAUSE LOSS OF HUMAN LIFE, BODILY INJURY, SERIOUS PROPERTY DAMAGE AND/OR SERIOUS PUBLIC IMPACT ("UNINTENDED USE").** Except for specific applications as expressly stated in this document, Unintended Use includes, without limitation, equipment used in nuclear facilities, equipment used in the aerospace industry, lifesaving and/or life supporting medical equipment, equipment used for automobiles, trains, ships and other transportation, traffic signaling equipment, equipment used to control combustions or explosions, safety devices, elevators and escalators, and devices related to power plant. **IF YOU USE PRODUCT FOR UNINTENDED USE, TOSHIBA ASSUMES NO LIABILITY FOR PRODUCT.** For details, please contact your TOSHIBA sales representative or contact us via our website.
- Do not disassemble, analyze, reverse-engineer, alter, modify, translate or copy Product, whether in whole or in part.
- Product shall not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable laws or regulations.
- The information contained herein is presented only as guidance for Product use. No responsibility is assumed by TOSHIBA for any infringement of patents or any other intellectual property rights of third parties that may result from the use of Product. No license to any intellectual property right is granted by this document, whether express or implied, by estoppel or otherwise.
- **ABSENT A WRITTEN SIGNED AGREEMENT, EXCEPT AS PROVIDED IN THE RELEVANT TERMS AND CONDITIONS OF SALE FOR PRODUCT, AND TO THE MAXIMUM EXTENT ALLOWABLE BY LAW, TOSHIBA (1) ASSUMES NO LIABILITY WHATSOEVER, INCLUDING WITHOUT LIMITATION, INDIRECT, CONSEQUENTIAL, SPECIAL, OR INCIDENTAL DAMAGES OR LOSS, INCLUDING WITHOUT LIMITATION, LOSS OF PROFITS, LOSS OF OPPORTUNITIES, BUSINESS INTERRUPTION AND LOSS OF DATA, AND (2) DISCLAIMS ANY AND ALL EXPRESS OR IMPLIED WARRANTIES AND CONDITIONS RELATED TO SALE, USE OF PRODUCT, OR INFORMATION, INCLUDING WARRANTIES OR CONDITIONS OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, ACCURACY OF INFORMATION, OR NONINFRINGEMENT.**
- Do not use or otherwise make available Product or related software or technology for any military purposes, including without limitation, for the design, development, use, stockpiling or manufacturing of nuclear, chemical, or biological weapons or missile technology products (mass destruction weapons). Product and related software and technology may be controlled under the applicable export laws and regulations including, without limitation, the Japanese Foreign Exchange and Foreign Trade Law and the U.S. Export Administration Regulations. Export and re-export of Product or related software or technology are strictly prohibited except in compliance with all applicable export laws and regulations.
- Product may include products subject to foreign exchange and foreign trade control laws.
- Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product. Please use Product in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive. **TOSHIBA ASSUMES NO LIABILITY FOR DAMAGES OR LOSSES OCCURRING AS A RESULT OF NONCOMPLIANCE WITH APPLICABLE LAWS AND REGULATIONS**

Toshiba Electronic Devices & Storage Corporation

<https://toshiba.semicon-storage.com/>