MG11 SERIES

CLOUD-SCALE CAPACITY HDD

Built on 50 years of Toshiba's HDD innovation, the MG11 Series delivers new levels of capacity, performance, and quality. Packing up to 24 TB [1] into a standard 3.5-inch [2] conventional magnetic recording (CMR) HDD, the MG11 Series enables cloud-scale infrastructure to build higher storage densities at lower TCO. The MG11 Series features up to a 10-disk helium-sealed 3.5-inch design, which leverages Toshiba's innovative Flux Control Microwave Assisted Magnetic Recording (FC-MAMR™) technology to achieve 2.4 TB per disk. Built to meet growing data storage demands, the MG11 Series has a high workload rating of 550 TB with 7200 rpm, and is available in 6 Gbps SATA and 12 Gbps SAS interfaces. Engineered for 24/7 quality and enterprise reliability, the MG11 Series has an MTTF of 2.5 million hours. SED and SIE options are available to secure data and deliver peace of mind. In addition to 24 TB, the MG11 is available in 22 TB, 20 TB, 18 TB, 16 TB, and 14 TB in both SAS and SATA interfaces with SIE and SED options.

Product image may represent a design model.

KEY FEATURES

- Up to 24 TB capacity
- Conventional Magnetic Recording (CMR) for broad compatibility
- Toshiba 2nd generation Flux Control Microwave-assisted Magnetic Recording (FC-MAMR™) Technology
- 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]
- Sanitize Instant Erase (SIE) option model and Self Encrypting Drive (SED) option model [5]

APPLICATIONS

- Data Center Applications
- Big Data
- Video Surveillance
- Capacity-Optimized Cloud-scale and Rack-Scale Storage Systems
- Compliance Data Archives and Data Life-Cycle Management Storage Systems
- Data Back-up Infrastructure

SPECIFICATION

Item		MG11ACA24T MG11ACP24T	MG11ACA22T MG11ACP22T	MG11ACA20T MG11ACP20T	MG11ACA18T MG11ACP18T	MG11ACA16T MG11ACP16T	MG11ACA14T MG11ACP14T
Interface		SATA-3.5a					
Formatted Capacity		24 TB	22 TB	20 TB	18 TB	16 TB	14 TB
Performance	Interface Speed [3]	6.0 Gbit/s, 3.0 Gbit/s, 1.5 Gbit/s					
	Rotation Speed	7200 rpm					
	Buffer Size [7]	1 GiB					
	Maximum Sustained Data Transfer Speed [6] (Typ.)	295 MiB/s	285 MiB/s	281 MiB/s			
Logical Data Block Length	MG11ACAxxxE/EY [8] MG11ACPxxxE [8]	HOST 512 B, DISK 4096 B					
Supply Voltage	Allowable Voltage	12 V[9] +/-10 %, 5 V[9] +10/-7 %[10]					
Power Consumption	Write / Read (4KB Q1) (Typ.)	8.11 W			7.89 W	7.41 W	
	Active Idle (Typ.)	4.35 W			4.16 W	3.66 W	
Acoustics [11] (Sound Power)	Idle (Typ.)	20 dB					
	Seek (Typ.)	32 dB					

Item		MG11SCA24T MG11SCP24T	MG11SCA22T MG11SCP22T	MG11SCA20T MG11SCP20T	MG11SCA18T MG11SCP18T	MG11SCA16T MG11SCP16T	MG11SCA14T MG11SCP14T
Interface		SAS-3 and later					
Formatted Capacity		24 TB	22 TB	20 TB	18 TB	16 TB	14 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]	1 GiB					
	Maximum Sustained Data Transfer Speed [6] (Typ.)	295 MiB/s	285 MiB/s	281 MiB/s			
Logical Data Block Length	MG11SCAxxxE/EY [8] MG11SCPxxxE [8]	HOST 512 B, DISK 4096 B HOST 520 B, DISK 4160 B HOST 528 B, DISK 4224 B					
Supply Voltage	Allowable Voltage	12 V[9] +/-10 %, 5 V[9] +10/-7 %[10]					
Power Consumption	Write / Read (4KB Q1) (Typ.)	8.57 W			8.36 W	7.90 W	
	Active Idle (Typ.)	4.83 W			4.62 W	4.16 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 [12]	5 % to 95 % R.H. (No condensation)
Altitude	Operating	-305 m to +3048 m (No condensation)
	Non-Operating [12]	-305 m to +12 192 m (No condensation)
Shock	Operating	490 m/s^2 { 50 G } (2 ms duration)
	Non-Operating [12]	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 [12] [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 = 2^{40} = 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] 1 GiB (gibibyte) = 1 073 741 824 bytes. 1 MiB (mebibyte) = 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
MG11ACA24TE	SATA-3.5a	24 TB	512e	
MG11ACA22TE	SATA-3.5a	22 TB	512e	
MG11ACA20TE	SATA-3.5a	20 TB	512e	
MG11ACA18TE	SATA-3.5a	18 TB	512e	
MG11ACA16TE	SATA-3.5a	16 TB	512e	
MG11ACA14TE	SATA-3.5a	14 TB	512e	
MG11ACA24TEY	SATA-3.5a	24 TB	512e	SIE
MG11ACA22TEY	SATA-3.5a	22 TB	512e	SIE
MG11ACA20TEY	SATA-3.5a	20 TB	512e	SIE
MG11ACA18TEY	SATA-3.5a	18 TB	512e	SIE
MG11ACA16TEY	SATA-3.5a	16 TB	512e	SIE
MG11ACA14TEY	SATA-3.5a	14 TB	512e	SIE
MG11ACP24TE	SATA-3.5a	24 TB	512e	SED
MG11ACP22TE	SATA-3.5a	22 TB	512e	SED
MG11ACP20TE	SATA-3.5a	20 TB	512e	SED
MG11ACP18TE	SATA-3.5a	18 TB	512e	SED
MG11ACP16TE	SATA-3.5a	16 TB	512e	SED
MG11ACP14TE	SATA-3.5a	14 TB	512e	SED

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

Model Number	Interface	Capacity	Sector Format	Optional Security
MG11SCA24TE	SAS-3.0	24 TB	512e	
MG11SCA22TE	SAS-3.0	22 TB	512e	
MG11SCA20TE	SAS-3.0	20 TB	512e	
MG11SCA18TE	SAS-3.0	18 TB	512e	
MG11SCA16TE	SAS-3.0	16 TB	512e	
MG11SCA14TE	SAS-3.0	14 TB	512e	
MG11SCA24TEY	SAS-3.0	24 TB	512e	SIE
MG11SCA22TEY	SAS-3.0	22 TB	512e	SIE
MG11SCA20TEY	SAS-3.0	20 TB	512e	SIE
MG11SCA18TEY	SAS-3.0	18 TB	512e	SIE
MG11SCA16TEY	SAS-3.0	16 TB	512e	SIE
MG11SCA14TEY	SAS-3.0	14 TB	512e	SIE
MG11SCP24TE	SAS-3.0	24 TB	512e	SED
MG11SCP22TE	SAS-3.0	22 TB	512e	SED
MG11SCP20TE	SAS-3.0	20 TB	512e	SED
MG11SCP18TE	SAS-3.0	18 TB	512e	SED
MG11SCP16TE	SAS-3.0	16 TB	512e	SED
MG11SCP14TE	SAS-3.0	14 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)
ISED (Innovation, Science and Economic Development Canada)
FCC (Federal Communications Commission)
Morocco Mark
Ukraine Mark

(Note) Marks of KC			
Made in Japan		1. 기기의 명칭(모델명):	MG11ACA24TE
		2. 인증번호:	R-R-T48-MG11ACA24TE
		3. 인증받은 자의 상호:	Toshiba Electronic Devices & Storage Corporation
		4. 제조년월일:	2024-04
		5. 제조자 / 제조국가:	Toshiba Electronic Devices & Storage Corporation / 일본
		1. 기기의 명칭(모델명):	MG11SCA24TE
		2. 인증번호:	R-R-T48-MG11SCA24TE
		3. 인증받은 자의 상호:	Toshiba Electronic Devices & Storage Corporation
		4. 제조년월일:	2024-04
		5. 제조자 / 제조국가:	Toshiba Electronic Devices & Storage Corporation / 일본
Made in China		1. 기기의 명칭(모델명):	MG11ACA24TE
		2. 인증번호:	R-R-T48-MG11ACA24TE
		3. 인증받은 자의 상호:	Toshiba Electronic Devices & Storage Corporation
		4. 제조년월일:	2024-04
		5. 제조자 / 제조국가:	Toshiba Electronic Devices & Storage Corporation / 중국
		1. 기기의 명칭(모델명):	MG11SCA24TE
		2. 인증번호:	R-R-T48-MG11SCA24TE
		3. 인증받은 자의 상호:	Toshiba Electronic Devices & Storage Corporation
		4. 제조년월일:	2024-04
		5. 제조자 / 제조국가:	Toshiba Electronic Devices & Storage Corporation / 중국
Made in Philippines		1. 기기의 명칭(모델명):	MG11ACA24TE
		2. 인증번호:	R-R-T48-MG11ACA24TE
		3. 인증받은 자의 상호:	Toshiba Electronic Devices & Storage Corporation
		4. 제조년월일:	2024-04
		5. 제조자 / 제조국가:	Toshiba Electronic Devices & Storage Corporation / 필리핀
		1. 기기의 명칭(모델명):	MG11SCA24TE
		2. 인증번호:	R-R-T48-MG11SCA24TE
		3. 인증받은 자의 상호:	Toshiba Electronic Devices & Storage Corporation
		4. 제조년월일:	2024-04
		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

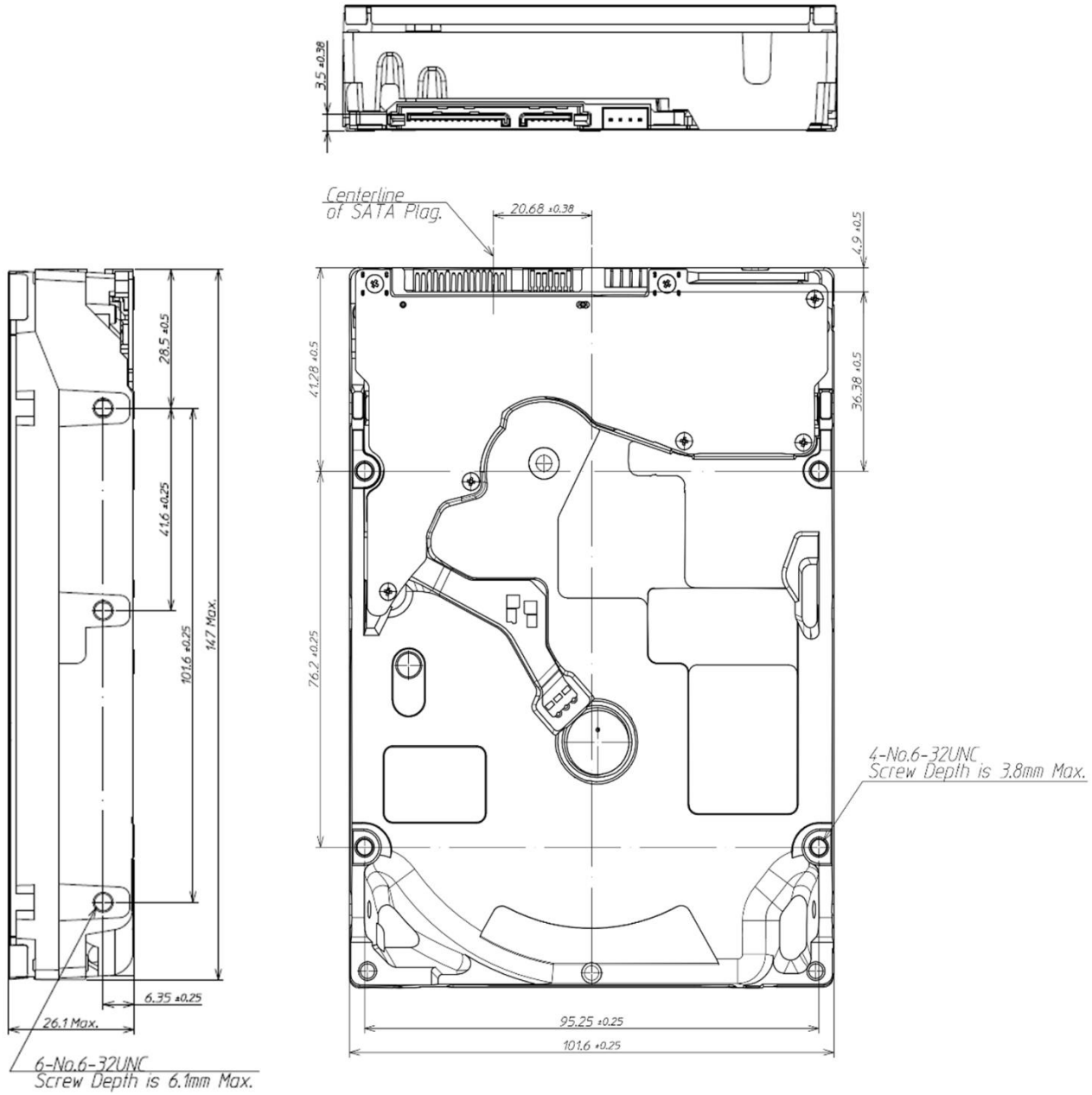
UKCA Marking

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

MECHANICAL SPECIFICATIONS

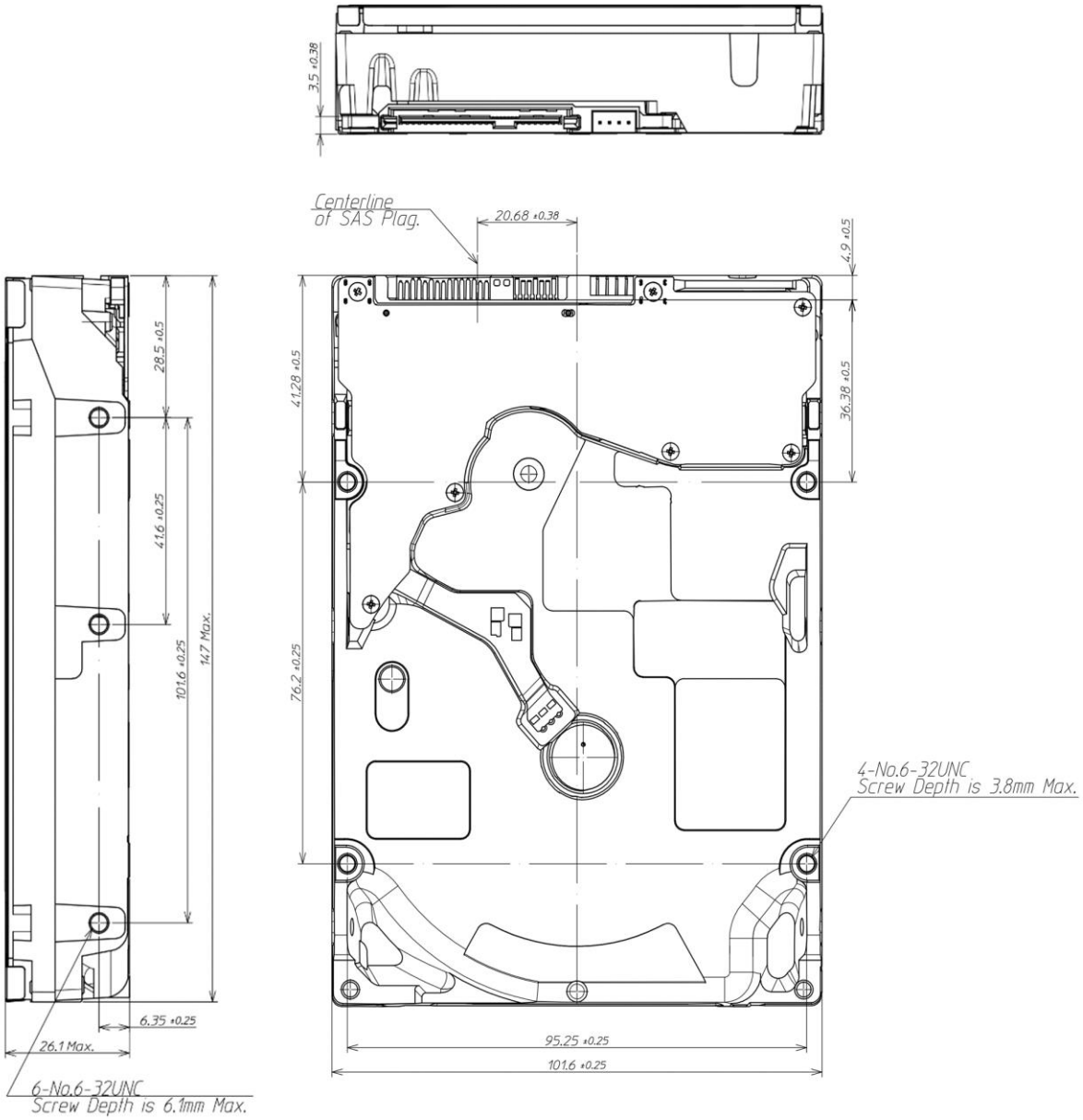
Item	MG11ACA24T MG11ACP24T	MG11ACA22T MG11ACP22T	MG11ACA20T MG11ACP20T	MG11ACA18T MG11ACP18T	MG11ACA16T MG11ACP16T	MG11ACA14T MG11ACP14T
Width (Max)	101.85 mm					
Height (Max)	26.1 mm					
Length (Max)	147.0 mm					
Weight (Max)	730 g					

[Unit: mm]

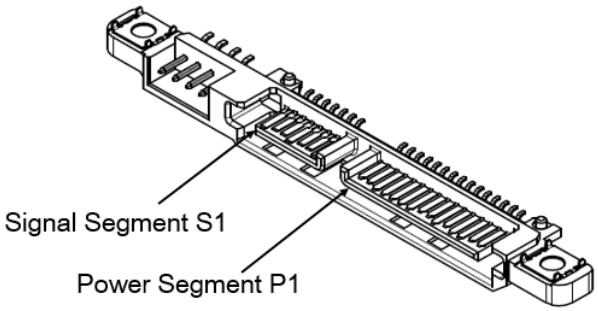


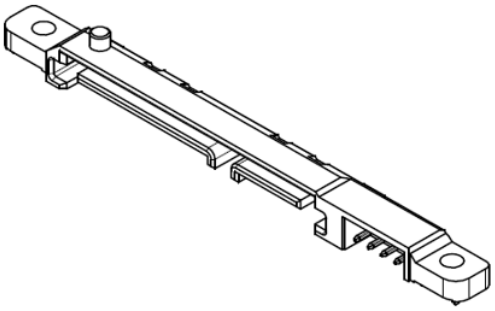
Item	MG11SCA24T MG11SCP24T	MG11SCA22T MG11SCP22T	MG11SCA20T MG11SCP20T	MG11SCA18T MG11SCP18T	MG11SCA16T MG11SCP16T	MG11SCA14T MG11SCP14T
Width (Max)	101.85 mm					
Height (Max)	26.1 mm					
Length (Max)	147.0 mm					
Weight (Max)	730 g					

[Unit: mm]

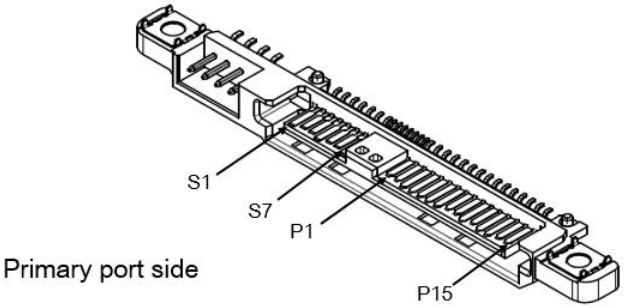


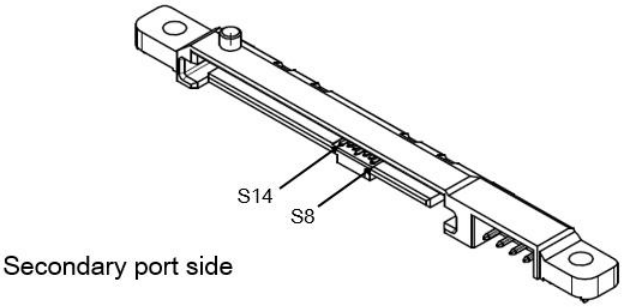
INTERFACE CONNECTOR





SATA plug connector overview
MG11ACA24T/22T/20T/18T/16T/14T
MG11ACP24T/22T/20T/18T/16T/14T





SAS plug connector overview
MG11SCA24T/22T/20T/18T/16T/14T
MG11SCP24T/22T/20T/18T/16T/14T

INTERFACE CONNECTOR (SATA plug) SIGNAL ALLOCATION

MG11ACA24T/22T/20T/18T/16T/14T
MG11ACP24T/22T/20T/18T/16T/14T

Segment	Pin No.	Pin Definition	
Signal Segment	S1	GND	2nd Mate
	S2	A+	Differential Pair A from PHY (Device Rx+)
	S3	A-	Differential Pair A from PHY (Device Rx-)
	S4	GND	2nd Mate
	S5	B-	Differential Pair B from PHY (Device Tx-)
	S6	B+	Differential Pair B from PHY (Device Tx+)
	S7	GND	2nd Mate
Power Segment	P1	-	(Unused)
	P2	-	(Unused)
	P3	PWDIS	Enter/Exit Power Disable (Option)
	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	Spin	Staggered Spin-up Mode Detect (Input)
		ACT	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

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

MG11SCA24T/22T/20T/18T/16T/14T

MG11SCP24T/22T/20T/18T/16T/14T

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)

MG11ACA24T/22T/20T/18T/16T/14T
MG11ACP24T/22T/20T/18T/16T/14T

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 DMA 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)

MG11ACA24T/22T/20T/18T/16T/14T
MG11ACP24T/22T/20T/18T/16T/14T

Op-Code	Command Name
10h	RECALIBRATE
65h	RECEIVE FPDMA QUEUED
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)

MG11SCA24T/22T/20T/18T/16T/14T

MG11SCP24T/22T/20T/18T/16T/14T

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)

MG11SCA24T/22T/20T/18T/16T/14T
MG11SCP24T/22T/20T/18T/16T/14T

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

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