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HDD

AL15SEB SERIES
ENTERPRISE PEFORMANCE HDD

The 12.0 Gbit/s[1] SAS interface AL15SEB Series Enterprise Performance HDDs provide up to 2.4 TB capacity and 10,500rpm performance with Enterprise-class reliability. Engineered for mission critical IT operations, including database servers and hybrid storage platforms, AL15SEB Series provides a range of models including 512 native (512n), or emulated 512 (512e) or 4K native(4Kn) sector length technologies for optimum application and operating system compatibility. Toshiba Persistent Write Cache technology protects against data loss in the event of unexpected power loss, and helps maintain suitable performance and data reliability for high-duty cycle Mission Critical environments.

Product image may represent a design model.

KEY FEATURES

- 2400, 1800, 1200, 900 and 600 GB[2] Capacity (Advanced Format sector technology models)
- 1200, 900, 600, 300GB (512n sector technology models)
- Space Efficient, Power Saving 2.5-inch[3] Form Factor
- 12.0 Gbit/s SAS Interface for Better Performance
- 10,500 rpm Performance
- Industry Leading Average Latency (2.86ms)
- 24/7 Mission Critical Workload Performance and Data Reliability
- 512n sector length support in all capacities for optimum legacy application compatibility
- Toshiba Persistent Write Cache Technology
- Sanitize Instant Erase (SIE[4]) Option

APPLICATIONS

- Tier 1 Mission-Critical Servers and RAID Storage
- Tier 1 Hybrid Storage platforms
- Servers hosting transaction-based applications
- Rack-Optimized Data Centers
- Content Serving with low-latency requirements
- Software-defined and Converged Storage architecture
- Mission-Critical Server Boot and Logging

SPECIFICATIONS

Model numbers		AL15SEB24EP AL15SEB24EQ	AL15SEB18EP AL15SEB18EQ	AL15SEB12EP AL15SEB12EQ	AL15SEB09EP AL15SEB09EQ	AL15SEB06EP AL15SEB06EQ
Interface		SAS-3.0				
Formatted Capacity		2,400 GB	1,800 GB	1,200 GB	900 GB	600 GB
Performance	Interface Speed	12.0 Gbit/s Max				
	Rotation Speed	10,500 rpm				
	Average Latency Time	2.86 ms				
	Buffer Size	128 MiB[5]				
	Data Transfer Speed (Sustained)	260.0 MiB/s				
Logical Data Block Length	AL15SEB**EP (fixed length)	4,096 B , 4,160 B , 4,224 B				
	AL15SEB**EQ (emulation)	HOST: 512 B, DISK: 4,096 B HOST: 520 B, DISK: 4,160 B HOST: 528 B, DISK: 4,224 B				
Supply Voltage	Allowable Voltage	12 V[6] ± 5 % / 5 V[6] ± 5%[7]				
Power Consumption[8]	Write/Read (200 I/O)	8.7 W	8.1 W	7.0 W	7.0 W	6.5 W
	Active Idle (Idle-A)	5.1 W	4.6 W	3.5 W	3.5 W	3.0 W
Acoustics (Sound Power)		31 dB Typ.				

Model Number		AL15SEB120N	AL15SEB090N	AL15SEB060N	AL15SEB030N
Interface		SAS-3.0			
Formatted Capacity		1200 GB	900 GB	600 GB	300 GB
Performance	Interface Speed	12.0 Gbit/s Max			
	Rotation Speed	10,500 rpm			
	Average Latency Time	2.86 ms			
	Buffer Size	128 MiB			
	Data Transfer Speed (Sustained)	234.0 MiB/s			222.5 MiB/s
Logical Data Block Length		512 B , 520 B , 524 B , 528 B			
Supply Voltage	Allowable Voltage	12 V[6] ± 5 % / 5 V[6] ± 5%[7]			
Power Consumption[8]	Read/Write (200I/O)	8.1 W	7.0 W	7.0 W	6.5 W
	Active Idle (Idle-A)	4.5 W	3.5 W	3.5 W	3.0 W
Acoustics (Sound Power)	Idle[12]	31 dB Typ.			

> ## ENVIRONMENTAL LIMITS

Item		Specification
Temperature	Operating	5 °C to 55 °C
	Non-Operating	- 40 °C to 70 °C
Humidity	Operating	5 % to 95 % R.H.
	Non-Operating	5 % to 95 % R.H.
Shock	Operating	980 m/s^2 { 100 G } / 2 ms duration
	Non-Operating	3,920 m/s^2 { 400 G } / 2 ms duration
Vibration[9]	Operating[10]	9.8 m/s^2 { 1 G } (20 to 300 Hz) or less
	Non-Operating[11]	49 m/s^2 { 5 G } (20 to 300 Hz) or less
Altitude	Operating	- 305 m to 3,048 m
	Non-Operating	- 305 m to 12,192 m

> ## RELIABILITY

Item	Specification
MTTF[12]	2,000,000 hours
Non-recoverable Error Rate	10 error per 10^{17} bits read
Load / Unload	600,000 times
Availability	24 hours/day, 7 days/week

[1] Read and write speed may vary depending on the host device, read and write conditions, and file size.
[2] Definition of capacity: We define 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 = 2^{30} = 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.
[3] "2.5-inch" describes the form factor of HDDs. They do not indicate drive's physical size.
[4] Sanitize Instant Erase. SIE is a function to invalidate the data recorded on the magnetic disks at a blink.
[5] 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 1,073,741,824 bytes.
[6] Input voltages are specified at the HDD connector side, during HDD ready state.
[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.
[8] Power supply at nominal voltage ±1%. 25°C ambient. Refer to Subsection 2.5 "Power conditions" of the SAS INTERFACE SPECIFICATION for details of idle and ready states. "Ready state" corresponds to 2.5.2 "Active state" of the SAS INTERFACE SPECIFICATION.
[9] Vibration applied to the HDD is measured at near the mounting screw hole on the frame as much as possible.
[10] At random seek write/read and default on retry setting with log sweep vibration.
[11] At power-off state after installation
[12] 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.

❯ MODEL NUMBERS

Model Numbers	Interface	Formatted Capacity	Sector Format	Optional Security Function
AL15SEB24EP	SAS-3.0	2400 GB	4Kn	
AL15SEB24EQ	SAS-3.0	2400 GB	512e	
AL15SEB18EP	SAS-3.0	1800 GB	4Kn	
AL15SEB18EQ	SAS-3.0	1800 GB	512e	
AL15SEB12EP	SAS-3.0	1200 GB	4Kn	
AL15SEB12EQ	SAS-3.0	1200 GB	512e	
AL15SEB120N	SAS-3.0	1200 GB	512n	
AL15SEB09EP	SAS-3.0	900 GB	4Kn	
AL15SEB09EQ	SAS-3.0	900 GB	512e	
AL15SEB090N	SAS-3.0	900 GB	512n	
AL15SEB06EP	SAS-3.0	600 GB	4Kn	
AL15SEB06EQ	SAS-3.0	600 GB	512e	
AL15SEB060N	SAS-3.0	600 GB	512n	
AL15SEB030N	SAS-3.0	300 GB	512 n	
AL15SEB24EPY	SAS-3.0	2400 GB	4Kn	SIE
AL15SEB24EQY	SAS-3.0	2400 GB	512e	SIE
AL15SEB18EPY	SAS-3.0	1800 GB	4Kn	SIE
AL15SEB18EQY	SAS-3.0	1800 GB	512e	SIE
AL15SEB12EPY	SAS-3.0	1200 GB	4Kn	SIE
AL15SEB12EQY	SAS-3.0	1200 GB	512e	SIE
AL15SEB120NY	SAS-3.0	1200 GB	512n	SIE
AL15SEB09EPY	SAS-3.0	900 GB	4Kn	SIE
AL15SEB09EQY	SAS-3.0	900 GB	512e	SIE
AL15SEB090NY	SAS-3.0	900 GB	512n	SIE
AL15SEB06EPY	SAS-3.0	600 GB	4Kn	SIE
AL15SEB06EQY	SAS-3.0	600 GB	512e	SIE
AL15SEB060NY	SAS-3.0	600 GB	512n	SIE
AL15SEB030NY	SAS-3.0	300 GB	512n	SIE

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> **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

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> ## SAFETY / EMI STANDARDS

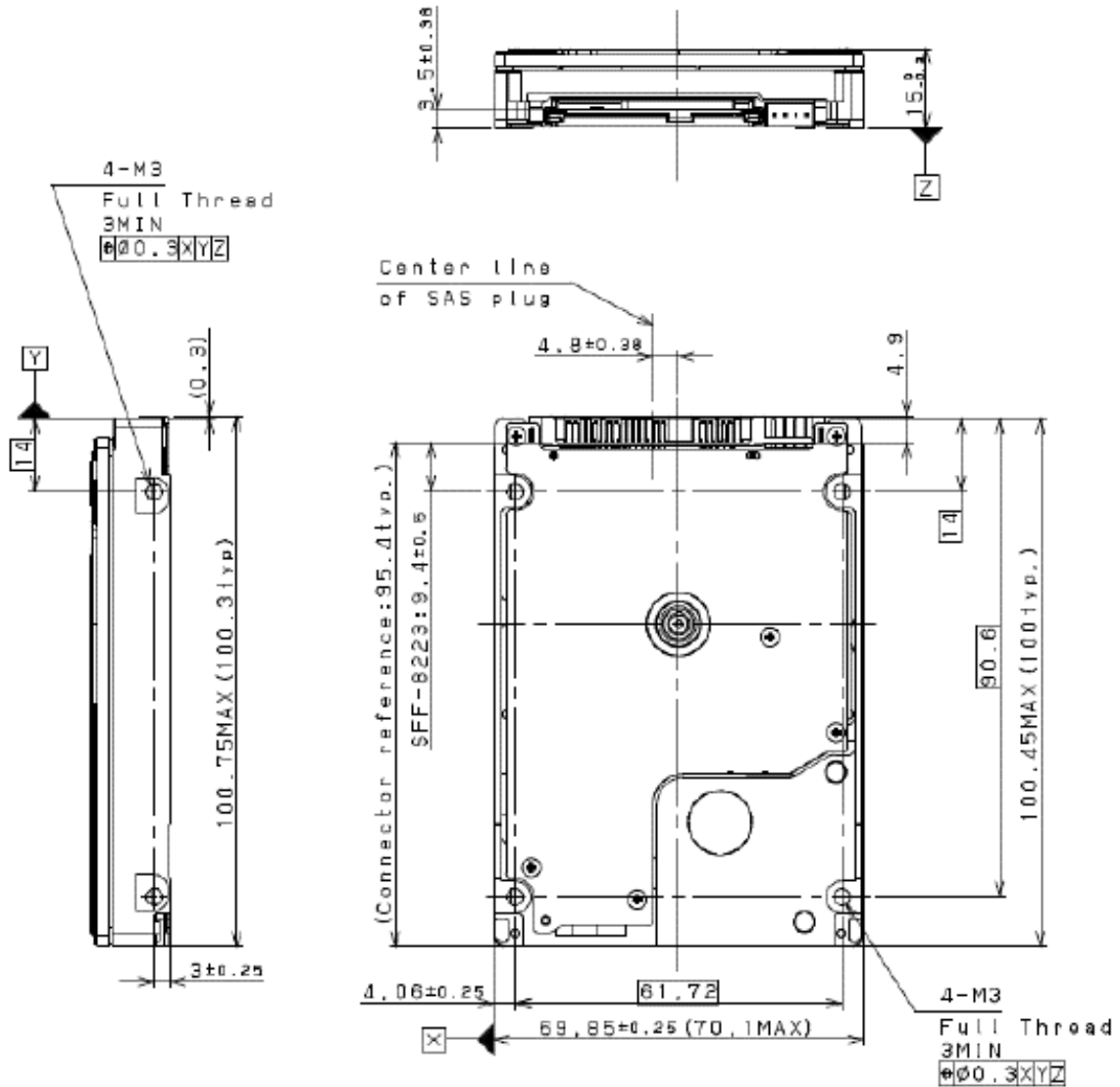| Title	Region
UL (Underwriters Laboratories)	USA
CSA (Canadian Standard Association)	Canada
TÜV (Technischer Überwachungs Verein)	Germany
BSMI (Bureau of Standards, Metrology and Inspection)	Taiwan
MSIP (Ministry of Science, ICT & Future Planning)	Korea
ACMA (Australian Communications and Media Authority)	Australia

(Note 1) Marks of KC	
Made in Japan	KC 1. 기기의 명칭(모델명) : AL15SEB24EQ 2. 인증번호 : MSIP-REM-T48-AL15SEB24EQ 3. 인증받은 자의 상호 : Toshiba Electronic Devices & Storage Corporation 4. 제조년월일 : 2017-07 5. 제조자 / 제조국가 : Toshiba Electronic Devices & Storage Corporation　/ 일본
Made in Philippines	KC 1. 기기의 명칭(모델명) : AL15SEB24EQ 2. 인증번호 : MSIP-REM-T48-AL15SEB24EQ 3. 인증받은 자의 상호 : Toshiba Electronic Devices & Storage Corporation 4. 제조년월일 : 2017-07 5. 제조자 / 제조국가 : Toshiba Electronic Devices & Storage Corporation　/ 필리핀

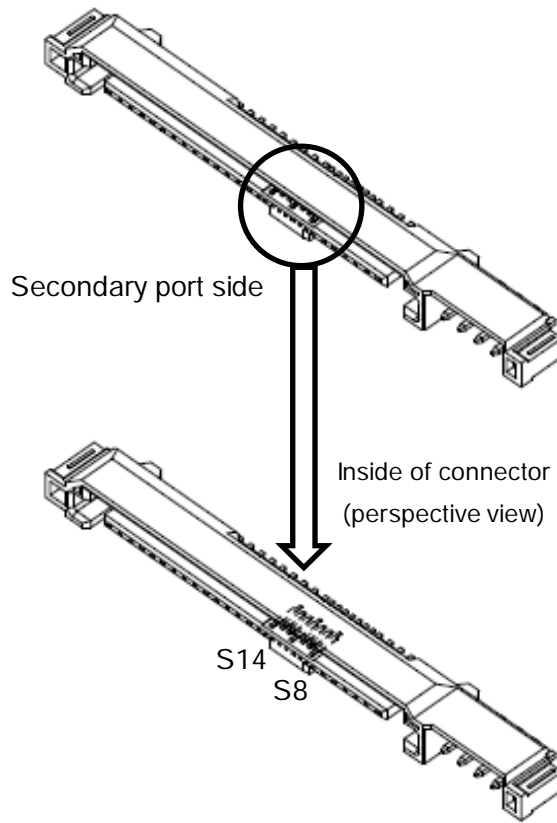| B급 기기 (가정용 방송통신기자재)	이 기기는 가정용(B급) 전자파적합기기로서 주로 가정에서 사용하는 것을 목적으로 하며, 모든 지역에서 사용할 수 있습니다.

› MECHANICAL SPECIFICATIONS

Item	Specification
Width	70.10 mm Max
Height	15.00 mm Max
Length	100.45 mm Max
Weight	230 g Max

[Unit: mm]
(Reference)

INTERFACE CONNECTOR

S1

S7

P 1

Primary port side

P 15

Secondary port side

Inside of connector
(perspective view)

S14

S8
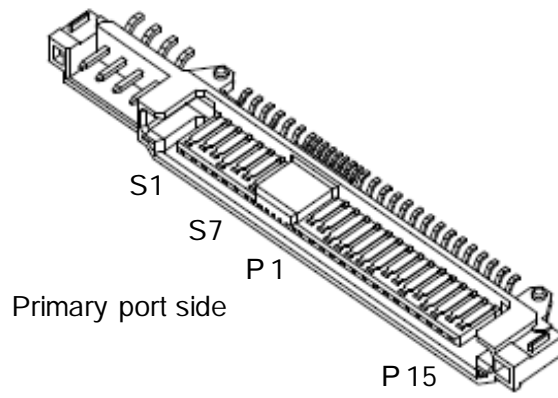
❯ INTERFACE CONNECTOR (SAS plug) SIGNAL ALLOCATION: CN1

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

Segment	Pin No.		Pin Definition
Power Segment	P1[13]	Reserved	Do not supply 3.3V power if POWER DISABLE Function is used.
	P2[13]	Reserved	
	P3[14]	POWER DISABLE	Power Disable Control input signal
	P4	GND	GROUND
	P5	GND	GROUND
	P6	GND	GROUND
	P7	+5V-Charge	Pre-charge pin for +5V
	P8	+5V	+5V power supply input
	P9	+5V	+5V power supply input
	P10	GND	GROUND
	P11	READY LED	READY LED output
	P12	GND	GROUND
	P13	+12V-Charge	Pre-charge pin for +12V
	P14	+12V	+12V power supply input
	P15	+12V	+12V power supply input

[13] P1 to P2 are +3.3V power supply input and pre-charge signals, and not used on the AL15SEB/SEQ series.
[14] 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.

COMMAND TABLE (Part 1)

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

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COMMAND TABLE (Part 2)

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
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)

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