OCZ STORAGE SOLUTIONS | A Toshiba Group Company

Saber 1000 Series Enterprise SSD

2.5” Solid-State Drive

SB1CSK31MT5XX-xxxx

The OCZ 2.5” Saber 1000 Series of Solid State Drives are designed specifically to address Enterprise storage and computing applications where demanding performance, reliability, and the total cost of ownership (TCO) are major factors.

SSD Datasheet

Saber 1000 Series SATA Solid State Drive

Part Number	Description	UPC
SB1CSK31MT560-0120	Saber 1000 Series, SATA III 2.5” MLC, 120GB	842024037224
SB1CSK31MT560-0240	Saber 1000 Series, SATA III 2.5” MLC, 240GB	842024036876
SB1CSK31MT570-0480	Saber 1000 Series, SATA III 2.5” MLC, 480GB	842024036883
SB1CSK31MT5D0-0960	Saber 1000 Series, SATA III 2.5” MLC, 960GB	842024036890

Released March 2015

- Available in 2.5” Form Factor
- SATA III / 6Gb/s Interface
- Capacity: 120GB, 240GB, 480GB and 960GB
- Components: A19nm MLC NAND Flash Memory
- Security: AES 256-bit Encryption
- Bandwidth Performance Specifications[1,3,4]
  - Sustained Sequential Read: 550 MB/s
  - Sustained Sequential Write: 500 MB/s
- Read and Write IOPS specifications (Full LBA Range, Iometer*Queue Depth 32)[1,2,4]
  - Sustained Random 4KB Reads: up to 95K IOPS
  - Sustained Random 4KB Writes: up to 20K IOPS
- Compatibility
  - SATA Revision 3.0, compatible with SATA 1.5 Gb/s, 3 Gb/s and 6Gb/s interface rates
  - ATA/ATAPI-8 Compliant
  - SMART ATA feature set
  - Native Command Queuing (NCQ) command set
  - Data set management TRIM Command
- Power Management
  - 5 V SATA Supply Rail
  - Supports ATA Power Management Specification
  - OS-Aware Hot Plug/Removal
- Power Specifications[5]
  - Active: up to 3.7W (Typical)
  - Idle: up to 1 W (Typical)
- Temperature
  - Operating[6]: 0°C to 70°C
  - Non-Operating: -45°C to 85°C
  - Temperature monitoring
- Reliability
  - Mean Time Between Failures (MTBF): 2 Million Hours
- Endurance Rating
  - 0.4 DWPD
- Bit Error Rate (BER): 1 sector per 10^{15} bits read
- Power Failure Management Plus (PFM+) – partial PFAIL prevents “brick drive” syndrome, so the SSD remains operational post outage
- Shock (Operating and non-operating)
  - 1000G/0.5 msec.
- Vibration
  - Operating Range - 2.17 GRMS (5-700 Hz)
  - Non-operating: 3.13 GRMS (5-800 Hz)
- Altitude
  - Operating Range: -1000 ft. to 10,000 ft.
  - Non-operating: -1000 ft. to 40,000 ft.
- Product Ecological Compliance
  - RoHS
- Certifications and Declarations:
  - CE, FCC, KCC, BSMI, C-TICK, VCCI, RoHS, cUL, WEEE
  - Services and Support: 5 years

1. Performance values vary by capacity
2. Based on Random 4KB QD32 workload, measurement taken once the workload has reached steady state
3. Based on 128KB sequential transfer, measurement taken once the workload has reached steady state
4. Sustained performance measured using IOmeter* with Queue Depth 32. Measurements are performed using SNIA based metrics.
5. Power based on 5V supply and highest capacity
6. As measured by temperature sensor

Part Number Decoder:

# of chars	3	1	1	1	1	1	1	1	1	1	1	1	4	*2 (OPTIONAL)*
	[xxx]	[x]	[x]	[x]	[x]	[x]	[x]	[x]	[x]	[x]	[x]	-	[xxxx]	*[xx]*

Product:
ITD: Intrepid
DEN: Deneva 1
D2: Deneva 2 [no longer conforms]
ZD4: Z-Drive 4500
RV3: Revo 3
TL2: Talos 2
DNx: Future Deneva (e.g. "DN3")
ZD6: Z-Drive R6
TL3: Talos 3
IT3: Intrepid 3000 Series
SB1: Saber 1000 Series

Level:
C: Commercial
R: Reliability

Interface:
S: SATA
A: SAS
P: PCIe

Interface:
B: 1.5Gb SATA
D: 2.5b PCI-e 1.0
E: 3Gb SATA 2/SAS 3
F: 5Gb PCI-e 2.0
K: 6Gb SATA 3/SAS 6
L: PCIe Gen 3.0 x4
M: PCIe Gen 3.0 2x2
N: PCIe Gen 3.0 x8
O: PCIe Gen 3.0 x16
P: 16Gb/s SATA Express
Q: 12Gb dual port SAS

Form Factor:
1: 1.8"
2: 2.5" 5mm
3: 2.5" 7mm
4: 2.5" 9.5mm
5: 2.5" 15mm
6: 3.5"
A: HHHL
B: HHFL
C: FHHL
D: FHFL
E: mSATA

Controller Count:
1: 1
2: 2
4: 4
8: 8

Flash Type:
S: SLC
M: MLC
E: eMLC
A: Async MLC
T: TLC

Flash Vendor
X: Unlocked
M: Micron
N: Intel
T: Toshiba
H: Hynix
S: Samsung
D: Sandisk
Z: OCZ

Flash Node
0: 24nm
1: 22nm
2: 20nm
3: 19nm
4: 16nm
5. A19nm

Flash Part # Detail*

Revision**

Density:
0200: 200GB
0500: 500GB
0800: 800GB
1000: 1000GB
1200: 1200GB
1500: 1500GB
1600: 1600GB
2000: 2000GB
3200: 3200GB

Temp:
IT: Industrial
ET: Extended

**"Flash Part # Detail" starts at "0" and increments as necessary to specify multiple NAND part numbers within a single "vendor and lithography" combination. As new NAND ICs are used, they should be added to and assigned a number. After 0-9, the code will progress to alphabetic characters starting with "A". Refer to the "Flash Part # Detail" tab in this workbook for pre-existing assignments and to add new assignments.*

***"Revision" starts at "0" and increments to capture miscellaneous customer-relevant product changes.*

Flash Part # Detail Code	Flash Description
0	"Gen 1" Toshiba 19nm MLC, 128Gb (64Gb DDP)
1	"Gen 1" Toshiba 19nm MLC, 256Gb (64Gb QDP)
2	"Gen 1" Toshiba 19nm MLC, 512Gb (64Gb ODP)
3	"Gen 1" Toshiba 19nm eMLC, 128Gb (64Gb DDP)
4	"Gen 1" Toshiba 19nm eMLC, 256Gb (64Gb QDP)
5	"Gen 1" Toshiba 19nm eMLC, 512Gb (64Gb ODP)
6	A19 Toshiba 19nm MLC, 128Gb *(64Gb DDP)*
7	A19 Toshiba 19nm MLC, 256Gb *(64Gb QDP)*
8	A19 Toshiba 19nm MLC, 512Gb (64Gb ODP)
9	A19 Toshiba 19nm eMLC, 128Gb *(64Gb DDP)*
A	A19 Toshiba 19nm eMLC, 256Gb *(64Gb QDP)*
B	A19 Toshiba 19nm eMLC, 512Gb *(64Gb ODP)*
C	A19 Toshiba 19nm MLC, 256Gb *(128Gb DDP)*
D	A19 Toshiba 19nm MLC, 512Gb *(128Gb QDP)*
E	A19 Toshiba 19nm MLC, 1024Gb *(128Gb ODP)*
F	A19 Toshiba 19nm eMLC, 256Gb *(128Gb DDP)*
G	A19 Toshiba 19nm eMLC, 512Gb *(128Gb QDP)*
H	A19 Toshiba 19nm eMLC, 1024Gb *(128Gb ODP)*

1. Introduction

This document describes the specification and capabilities of OCZ Saber 1000 Series Solid State Drives. The OCZ Saber 1000 Series SSDs are optimized to deliver high read performance and reliability that is required for entry-level enterprise applications.

1.1 Product Overview

The Saber 1000 Series SSDs deliver excellent steady state performance, with highly developed flash management capabilities that extends NAND flash life and enhance drive reliability.

Built with the OCZ Barefoot 3 controller combined with OCZ's optimized firmware architecture, Saber 1000 Series SSDs deliver data at a high-level of application performance. The drive also comes with built in Power Failure Management Plus (PFM+) protection that ensures that the drive will not "brick" during unexpected power loss situations, and remain operational post outage.

This 2.5" form factor SSD product has a Serial ATA-6Gb/s interface and it is designed using Toshiba A19nm MLC NAND flash memory available in 120GB, 240GB, 480GB, 960GB capacities.

OCZ Saber 1000 Series SSDs offers these key features:

- Comprehensive S.M.A.R.T. attributes
- Power Failure Management Plus (PFM+) to avoid "brick drive" syndrome
- UBER: 10^{15} bits read
- Temperature Sensor for monitoring and logging
- Inrush current management
- AES 256-bit Encryption
- 0.4 DWPD
- Backed by a 5 year warranty

2. Product Regulatory Certification and Compliance

Table 1.

Certification/Compliance	Description
CE Compliant	Low Voltage DIRECTIVE 2006/95/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 12 December 2006, and EMC Directive 2004/108/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 15 December 2004.
FCC Compliant B	FCC Class B devices are those that are for use in a commercial. Industrial or business environment. Class B devices are those that are marketed for use in the home.
KC mark (Korea Certification)	Compliance with paragraph 1 of Article 11 of the Electromagnetic Compatibility Control Regulation and meets the Electromagnetic Compatibility (EMC) Framework requirements of the Radio Research Laboratory (RRL) Ministry of Information and Communication Republic of Korea.
BSMI	Bureau of Standards, Metrology, and Inspection (BSMI) is required for electrical, mechanical, and chemical products.
C-TICK	Compliance with the Australia/New Zealand Standard AS/NZS3548 and Electromagnetic Compatibility (EMC) Framework requirements of the Australian Communication Authority (ACA).
VCCI	Voluntary Control Council for Interface to cope with disturbance problems caused by personal computers or facsimile.
RoHS Compliant	Restriction of Hazardous Substance Directive.

cUL Recognized	UL 60950-1 - Information Technology Equipment - Safety - Part 1: General Requirements and CSA C22.2 No. 60950-1-07 - Information Technology Equipment - Safety - Part 1: General Requirements
WEEE	The Waste Electrical and Electronic Equipment Directive (WEEE Directive) is the European Community directive 2002/96/EC on waste electrical and electronic equipment.

3. Product Specifications

3.1 Capacity

Table 2.

RAW Capacity	Usable Capacity	Total User Addressable Sectors in LBA Mode
128GB	120GB	234,441,648
256GB	240GB	468,862,128
512GB	480GB	937,703,088
1024GB	960GB	1,875,385,008

Notes: 1GB = 1billion bytes, actual formatted capacity less

LBA count shown represents total user storage capacity and will remain the same throughout the life of the drive. The total usable capacity of the SSD may be less than the total physical capacity because a small portion of the capacity is used for NAND flash management and maintenance purposes.

3.2 Performance

Table 3. Maximum Sequential Read and Write Bandwidth

Metric	Units	OCZ Saber 1000			
		120GB	240GB	480GB	960GB
Max Read	MB/s	550	550	550	550
Max Write	MB/s	310	500	470	430

Notes: Maximum performance measured using SNIA IOmeter* 2010 Benchmarks, 1M block, Queue Depth 32

Table 4. Maximum Random Read/Write Input/Output per Second (IOPS)

Metric	Units	OCZ Saber 1000			
		120GB	240GB	480GB	960GB
4KB Random Read	IOPS	82,000	90,000	96,000	95,000
4KB Random Write		81,000	80,000	87,000	83,000

Notes:

Performance measured using SNIA IOmeter*, with Queue Depth 32, 1 minute. Measurements are performed on a full Logical Block Address (LBA) using 4KB Random Writes/Reads

Table 5. Sustained Performance

Metric	Units	OCZ Saber 1000			
		120GB	240GB	480GB	960GB
128K Sequential Read[1]	MB/s	550	550	550	550
128K Sequential Write[1]	MB/s	310	500	470	430
4K Random Read[1]	IOPS	84,000	89,000	95,000	94,000
4K Random Write[1]	IOPS	13,000	20,000	17,000	10,000

Notes: [1]Sustained performance measured using IOmeter* with Queue Depth 32. Measurements are performed using SNIA based metrics.

4. Reliability

OCZ Saber 1000 Series SSDs meets or exceeds SSD endurance and data retention requirements as specified in the JESD218 standard. Reliability specifications are listed in the tables below:

4.1 Endurance Rating

The Endurance Rating of the SSD is represented in DWPD, Drive Writes Per Day, complete drive writes by a host to the SSD over 5 years. TBW, terabyte written by a host to the SSD over 5 years.

Table 6.

Description	I/O Workload Condition	120GB	240GB	480GB	960GB
DWPD over product lifetime	4K Random Write	0.4	0.4	0.4	0.4
TBW over product lifetime	4K Random Write[1]	84	161	343	692

Notes: [1] TBW is the total amount of data written for entire product lifetime. 1 Terabyte = 1,000,000,000 Byte.

4.2 Reliability Specifications

Table 7.

Parameter	Value
Data Retention The time period for retaining data in the NAND at maximum rated endurance	1 year power-off retention once SSD reaches rated write endurance at 40°C
MTBF Mean Time Between Failures is estimated based on Telcordia* methodology and demonstrated through Reliability Demonstration Test (RDT).	2,000,000 hours
Error Correction Code (ECC) Error-Correcting Code defines the number of correctable symbols for a given size of data.	40 bits correctable per 1K/data path parity protection

Uncorrectable Bit Error Rate (UBER) Uncorrectable bit error rate will not exceed one sector in the specified number of bits read. In the unlikely event of a non-recoverable read error, the SSD will report it as a read failure to the host; the sector in error is considered corrupt and is not returned to the host.	1 sector per 10^{15} bits read with 1 year data retention at the end of life

5. Electrical Characteristics

5.1 Supply Voltage

Table 8.

Description	Min	Max	Unit
Operating Voltage for 5 V (+/- 5%)	4.75	5.25	V

5.2 Power Consumption: (5V Supply)

Table 9.

Mode	Typical	Unit
Active[1]	3.7	W
Idle[2]	1	W

Notes:

[1] IOmeter 2008 is used to measure the values @ QD128 for Random Read/ Write, Sequential Read/Write @ 4K to 256K blocks.

[2] Idle modes are measured off power supply using Bench Supply Software for maximum, average and minimum values.

6. Environmental Specifications

6.1 Temperature, Shock, Vibration, Altitude

Table 10.

Temperature	Range
Case Temperature Operating[1] Non-operating	0 – 70°C -45 – 85°C
Shock, Vibration, Altitude	**Range**
Shock[2] Operating Non-operating	1000G/0.5ms 1000G/0.5ms
Vibration[3] Operating Non-operating	2.17 GRMS (5-800 Hz) 3.13 GRMS (5-800 Hz)
Altitude[4] Operating Non-operating	-1000 ft. to 10,000 ft. -1000 ft. to 40,000 ft.

Notes:

[1]As measured by temperature sensor
[2]Shock specifications assume the SSD is mounted securely with the input vibration applied to the drive-mounting screws. Stimulus may be applied in the X, Y or Z axis. Shock specification is measured using Root Mean Squared (RMS) value.
[3] Vibration specifications assume the SSD is mounted securely with the input vibration applied to the drive-mounting screws. Stimulus may be applied in the X, Y or Z axis. Vibration specification is measured using RMS value.
[4]Applies to atmospheric pressure only

6.2 Acoustics

The drive has no moving or noise-emitting parts. Therefore, it produces no audible sound (0 dB) in all modes of operation.

6.3 Emissions

The OCZ Saber 1000 Series SSDs are compliant to the FCC and CE Emission regulations.

Table 11.

Standards	Description	Results
FCC § 15.107	Conducted Emissions	Compliant
FCC § 15.109	Radiated Emissions	Compliant
EN 55024 § 4.2.1	Electrostatic Discharge EN 61000-4-2	Compliant
EN 55024 § 4.2.2	Electrical Fast Transients EN 61000-4-4	Compliant
EN 55024 § 4.2.3.1	Continuous Radiated Disturbances EN 61000-4-3	Compliant
EN 55024 § 4.2.3.2	Continuous Conducted Disturbances EN 61000-4-6	Compliant
EN 55024 § 4.2.4	Power-frequency Magnetic Fields EN 61000-4-8	N/A
EN 55024 § 4.2.5	Surges EN 61000-4-5	Compliant
EN 55024 § 4.2.6	Voltage Dips and Interruptions EN 61000-4-11	Compliant
EN 55022 § 5	Conducted Emissions	Compliant
EN 55022 § 6	Radiated Emissions	Compliant
EN 61000-3-2	Harmonic Current Emissions	Compliant
EN 61000-3-3	Voltage Fluctuations and Flicker	Compliant

7. Additional Features

7.1 Encryption

The OCZ Saber 1000 Series SSDs features AES-256-bit encryption with automatic hardware encryption to provide protection of all metadata and user's data at all times.

7.2 Power Failure Management

The OCZ Saber 1000 Series SSD supports Power Failure Management Plus (PFM+), or partial PFAIL, which prevents "brick drive" syndrome so the SSD remains operational post outage. In flight data is not protected for unexpected system power loss.

7.3 Temperature Monitor and Logging

The Saber 1000 Series SSDs has an internal temperature sensor for monitoring temperature. The feature can be monitored using SMART attributes.

7.4 Device Activity Signal (DAS) indication

The Saber 1000 Series SSD DAS LED polarity is set automatically to the default state during manufacturing. The polarity can be inverted in the field using Clout.

7.5 Secure Erase

OCZ recommends the use of the Secure Erase feature prior to reformatting a used SSD.

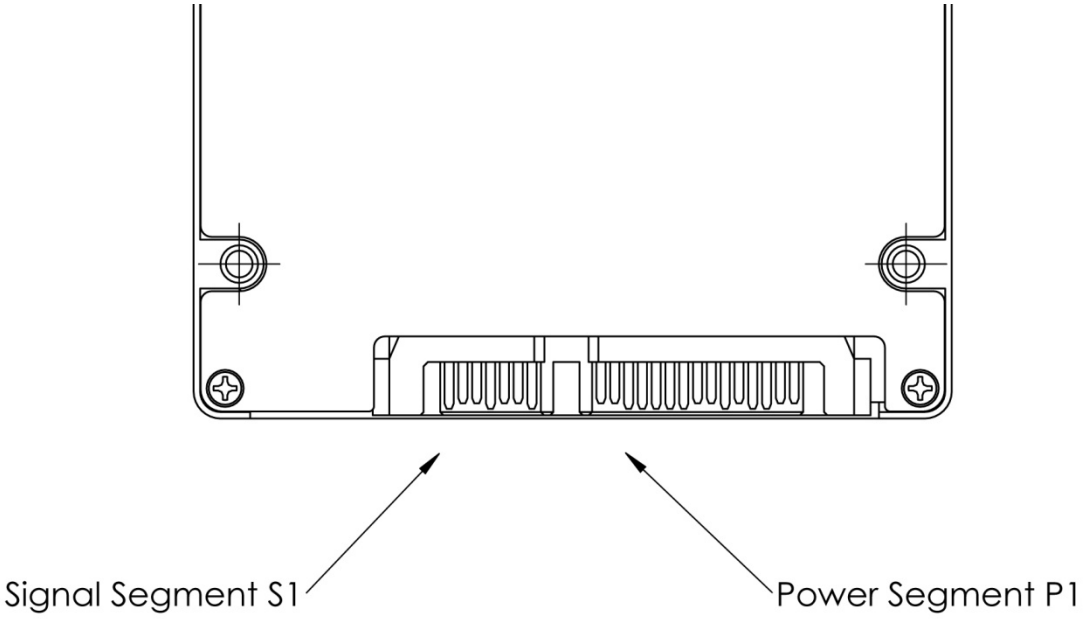
7.6 Force Unit Access (FUA)

The Saber 1000 Series does not currently support FUA.

8. Pin and Signal Descriptions

This section identifies the pin locations and signal descriptions of the OCZ High Performance SSD's.

8.1 Pin Locations



8.2 Hot Plug Support

Hot Plug insertion and removal are supported in the presence of a proper connector and appropriate operating system (OS) support as described in the SATA 2.6 specification. This product supports Asynchronous Signal Recovery and will issue an unsolicited COMINIT when first mated with a powered connector to guarantee reliable detection by a host system without hardware device detection.

8.3 Signal Description Table

Table 12.

	No.	Plug Connector pin definition	
Signal	S1	GND	2nd mate
	S2	A+	Differential signal A from PHY
	S3	A-	

	No.	Plug Connector pin definition	
	S4	GND	2nd mate
	S5	B-	Differential signal B from PHY
	S6	B+	
	S7	GND	2nd mate
Key and spacing separate signal and power segments			
Power	P1	V33	3.3V power (Unused)
	P2	V33	3.3V power (Unused)
	P3	V33	3.3V power, pre-charge, 2nd mate (Unused)
	P4	GND	1st mate
	P5	GND	2nd mate
	P6	GND	2nd mate
	P7	V5	5V power, pre-charge, 2nd mate
	P8	V5	5V power
	P9	V5	5V power
	P10	GND	2nd mate
	P11	DAS/DSS	Device Activity Signal
	P12	GND	1st mate
	P13	V12	12V power, pre-charge, 2nd mate (Unused)
	P14	V12	12V power (Unused)
	P15	V12	12V power (Unused)

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9. ATA Support

The OCZ Saber 1000 Series SSD supports ATA-8 features listed in the table below:

Table 13.

Feature	ATA-8 Reference
General	4.2
48-bit address	4.4
General purpose logging (GPL)	4.10
Host protected area (HPA)	4.11
Native command queuing (NCQ)	4.15
Power management	4.18
Security	4.20
S.M.A.R.T.	4.21
TRIM	ATA/ATAPI Command Set (ACS-2)

9.1 ATA Command Support

The OCZ Saber 1000 Series SSD supports all the commands described in the table below and complies with ATA-8/ACS-2 specification.

Table 14.

OpCode	Command
C4h	READ MULTIPLE
CAh	WRITE DMA
C8h	READ DMA
E1h	IDLE IMMEDIATE
E3h	IDLE
E4h	READ BUFFER
E5h	CHECK POWER MODE
E7h	FLUSH CACHE

Opcode	Command
E0h	STANDBY IMMEDIATE
EFh	SET FEATURES
70h	SEEK
C6h	SET MULTIPLE MODE
F6h	SECURITY DISABLE PASSWORD
F1h	SECURITY SET PASSWORD
F2h	SECURITY UNLOCK
39h	WRITE MULTIPLE EXT

OpCode	Command
ECh	IDENTIFY DEVICE
F8h	READ NATIVE MAX ADDRESS
FEh	VENDOR SPECIFIC COMMAND
00h	NOP
2Fh	READ LOG EXT
06h	DATA SET MANAGEMENT
10h	RECALIBRATE
20h	READ SECTOR(S)
24h	READ SECTOR(S) EXT
25h	READ DMA EXT
27h	READ NATIVE MAX ADDRESS EXT
29h	READ MULTIPLE EXT
30h	WRITE SECTOR(S)
40h	READ VERIFY SECTOR(S)
42h	READ VERIFY SECTOR(S) EXT
60h	READ FPDMA QUEUED
90h	EXECUTE DEVICE DIAGNOSTIC
91h	INITIALIZE DEVICE PAREMETERS
92h	DOWNLOAD MICROCODE

Opcode	Command
37h	SET MAX ADDRESS EXT
E2h	STANDBY
F3h	SECURITY ERASE PREPARE
35h	Write DMA EXT
34h	WRITE SECTOR(S) EXT
E6h	SLEEP
3Dh	WRITE DMA FUA EXT
C5h	WRITE MULTIPLE
61h	Write FPDMA Queued
CEh	WRITE MULTIPLE FUA EXT
D0h	SANITARY ERASE (VENDOR SPECIFIC COMMAND)
B0h	SMART
F5h	SECURITY FREEZE LOCK
F9h	SET MAX ADDRESS
F4h	SECURITY ERASE UNIT

9.2 IDENTIFY Device Data

The table below shows 256 words (512 bytes) of sector data returned after the host issues an IDENTIFY DEVICE command. All references comply with ACS-2 specification.

Table 15.

Word	Setting	Default Value	Description
0	M	0000h	0 = ATA device
1	X	3FFFh	Obsolete
2	O	C837h	Obsolete
3	X	0010h	Obsolete
4-5	X	0h	Retired
6	X	003Fh	Obsolete
7-8	V	0h	Reserved for assignment by the CFA association
9	X	0h	Retired
10-19	M	Varies	Serial number (20 ASCII characters)
20-21	X	0000h FFFFh	Retired
22	X	3000h	Obsolete
23-26	M	Varies	Firmware revision (8 ASCII characters)
27-46	M	Varies	Model number (40 ASCII characters)
47	M	8010h	Max. number of sectors transferred per interrupt on MULTIPLE commands
48	O	4000h	Trusted Computing feature set options
49	M	2F00h	Reserved for IDENTIFY packet device command
50	F	4000h	Capabilities
51-52	X	0h	Obsolete
53	M	0006h	Word 88 and 70:64 valid
54	X	3FFFh	Obsolete
55	X	0010h	Obsolete
56	X	003Fh	Obsolete
57-58	X	FC10h	Obsolete
59	M	0110h	Number of sectors transferred per DRQ interrupt on MULTIPLE commands
60-61	M	FFFFh 0FFFh	Total number of user addressable sectors
62	X	0h	Obsolete
63	M	0007h	Reserved
64	M	0003h	PIO modes supported (ATA only)

Word	Setting	Default Value	Description
65	M	0078h	Minimum Multiword DMA transfer cycle time per word
66	M	0078h	Manufacturer's recommended Multiword DMA transfer cycle time
67	M	0078h	Minimum PIO transfer cycle time without flow control
68	M	0078h	Minimum PIO transfer cycle time without IORDY flow control
69	O	0D00h	Additional supported
70	X	0h	Reserved
71-74	F	0h	Reserved for the IDENTIFY PACKET DEVICE command
75	O	001Fh	Queue depth support
76	O	010Eh	Serial ATA capabilities
77	F	0006h	Reserved for Serial ATA future definition
78	O	0016h	Serial ATA features supported
79	O	0014h	Serial ATA features enabled
80	M	03C0h	Major Version number
81	M	0000h	Minor Version number
82	M	742Bh	Command and feature sets supported
83	M	5401h	Command and feature sets supported
84	M	4160h	Command and feature sets supported
85	M	7469h	Command and feature sets supported
86	M	9401h	Command and feature sets supported
87	M	4160h	Command and feature sets supported
88	O	407Fh	Ultra DMA Modes
89	O	000Ah	Time required for security erase unit completion
90	O	00C8h	Time required for enhanced security erase completion
91	O	0h	Current advanced power management
92	O	FFFEh	Master password revision code
93	M	0h	Hardware reset result. The contents of bits (12:0) of this word shall change only during the execution of a hardware reset (see 7.18.7.47)
94	O	0h	Vendor's recommended and actual acoustic management value (see 7.18.7.48)
95	O	0h	Stream minimum request size
96	O	0h	Stream transfer time - DMA
97	O	0h	Streaming access latency – DMA and PIO

Word	Setting	Default Value	Description
98-99	O	0h	Streaming performance granularity
100-103	O	Varies	Maximum user LBA for 48-bit address feature set
104	O	0h	Streaming transfer time – PIO
105	O	0010h	Reserved
106	O	4000h	Physical sector size/logical sector size
107	O	0h	Inter-seek delay for ISO-7779 acoustic testing in microseconds
108-111	M	Varies	World Wide Name
112-115	O	0h	Reserved for World Wide Name extension to 128 bits
116	O	0h	Reserved for INCITS TR-37-2004
117-118	F	0h	Logical sector size (see 7.18.7.61)
119	M	4006h	Commands and feature sets supported
120	M	400Eh	Commands and feature sets supported
121-126	F	0h	Reserved for expanded supported and enable settings
127	X	0h	Obsolete
128	O	0001h	Security status
129-159	O	0h	Vendor specific
160	O	0h	CFA power mode (see 7.18.7.68)
161-175	O	0h	Reserved for the CompactFlash association
176-205	O	0h	Current media serial number (60 ASCII characters)
206	O	0021h	SCT command transport
207-208	O	0h	Reserved for CE-ATA
209	O	4000h	Alignment of logical blocks within a larger physical block
210-211	O	0h	Write-Read-Verify sector count mode 3 only
212-213	O	0000h 0000h	Write-Read-Verify sector count mode 2 only
214	O	0h	NV cache capabilities
215	O	0h	NV cache size in logical blocks
217	M	0001h	Nominal media rotation rate
218-221	F	0h	Reserved
222	M	107Fh	Transport major revision number
223	M	0h	Transport minor revision number
224-233	F	0h	Reserved for CE-ATA
234	O	0h	Minimum number of 512 byte units per DOWNLOAD
235	O	0h	Maximum number of 512 byte units per DOWNLOAD
256-254	F	0h	Reserved

Word	Setting	Default Value	Description
255	M	Varies	Integrity word

Setting:

F/V/X: Fixed/Variable/Undefined Content

O/M: Optional/Mandatory Requirement

9.3 Power Management Support

The OCZ Saber 1000 Series SDDs supports ATA and SATA power management modes as described below:

9.3.1 ATA Power Modes

The ATA power modes supported by OCZ Saber 1000 Series SSDs are:

- ACTIVE
- IDLE

9.3.2 SATA Link Power States

The SATA power states supported by the OCZ Saber 1000 Series SSDs are:

- ACTIVE: PHY Ready, full power, Tx & Rx operational

10. S.M.A.R.T. Attribute Support

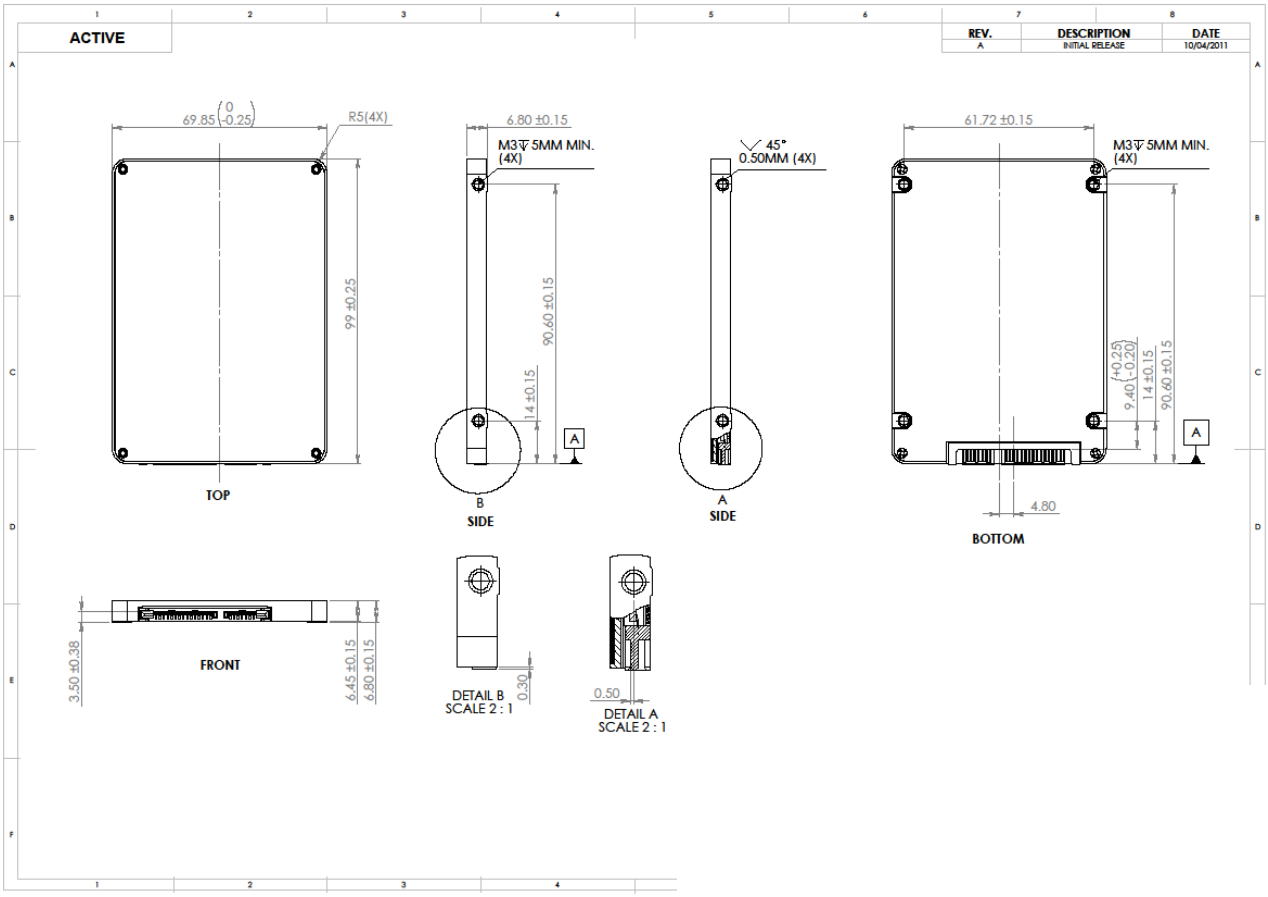
This section describes the S.M.A.R.T. (Self-Monitoring Analysis and Reporting Technology) attributes supported by the OCZ Saber 1000 Series SSDs and the corresponding threshold settings.

Table 16.

ID	Description
05h	SMART_RELLOCATED_SECTORS_COUNT
09h	SMART_POWER_ON_HOURS
0Ch	SMART_POWER_CYCLE_COUNT
ABh	SMART_OP_AVAIL_COUNT
AEh	SMART_POWER_CYCLE_UNMANAGED

BEh	SMART_TEMPERATURE
C3h	SMART_PROGRAM_FAILURE_BLK_CNT_ID
C4h	SMART_ERASE_FAILURE_BLK_CNT_ID
C5h	SMART_READ_FAILURE_BLK_CNT_ID
D0h	SMART_ERASE_COUNT_AVERAGE
D2h	SMART_SATA_ERR_CRC
E0h	SMART_IN_WARRANTY_FLAG
E1h	SMART_READ_LED_POLARITY
E2h	SMART_SUPERCAP_FAILURE
E9h	SMART_REMAINING_LIFE
F1h	SMART_TCNT_OF_WRITESECTORS_ID
F2h	SMART_TCNT_OF_READSECTORS_ID
F9h	SMART_TCNT_NAND_PROGRAM

11. Mechanical Specifications



Notes:

- All dimensions are in millimeters

12. Glossary

Term	Definition
ATA	Advanced Technology Attachment
ATAPI	Advanced Technology Attachment Packet Interface
DMA	Direct Memory Access
ECC	Error-Correcting Code
EXT	Extended
KB	KiloByte
MB	Mega-byte defined as $1x10^6$ bytes
Gb	Gigabit
GB	Giga-byte defined as $1x10^9$ bytes
TB	Terabyte
PB	Petabyte
GC	Garbage Collection, can be real time or idle time (background)
HDD	Hard Disk Drive
Hot Plug	A term used to describe the removal or insertion of a SATA hard drive when the system is powered on.
IOPS	Input output operations per second
LBA	Logical Block Address
TYP	Typical
MTBF	Mean time between failures
NCQ	Native Command Queuing. The ability of the SATA hard drive to queue and re-order commands to maximize execution efficiency.
NOP	No Operation
OS	Operating System
Port	The point at which a SATA drive physically connects to the SATA controller.
P/E	Program / Erase cycles, defines NAND lifecycle
UBER	Uncorrectable Bit Error Rate
SAS	Serial Attached SCSI
SATA	Serial ATA
SFF	Small Form Factor

SMART	Self-Monitoring, Analysis and Reporting Technology: an open standard for developing hard drives and software systems that automatically monitors a hard drive's health and reports potential problems.
SSD	Solid State Drive
MLC	Multi-level Cell
TRIM	ATA8 Command informing the drive when sectors no longer contain valid data

13. Revision History

Rev.	*Date*	*By*	*Reason For Change*
1.0	October 1, 2014	Product Management	Preliminary Release
1.1	March 3, 2015	Product Management	Final Release