Apacer

RoHS Compliant

micro Solid State Drive

SV170-µSSD BiCS5 Product Specifications

February 16, 2023

Version 1.4

Apacer Technology Inc.
1F, No.32, Zhongcheng Rd., Tucheng Dist., New Taipei City, Taiwan, R.O.C
Tel: +886-2-2267-8000 Fax: +886-2-2267-2261
www.apacer.com

Apacer

Specifications Overview:

- **Standard Serial ATA Interface**
  - SATA 6 Gb/s interface compliance
  - ATA-compatible command set
- **Capacity**
  - 60, 120, 240 GB
- **Performance**[1]
  - Burst read/write: 600 MB/sec
  - Sequential read: Up to 560 MB/sec
  - Sequential write: Up to 470 MB/sec
  - Random read (4K): Up to 67,000 IOPS
  - Random write (4K): Up to 83,000 IOPS
- **Flash Management**
  - Low-Density Parity-Check (LDPC) Code
  - Global Wear Leveling
  - Flash bad-block management
  - Flash Translation Layer: Page Mapping
  - S.M.A.R.T.
  - Power Failure Management
  - ATA Secure Erase
  - Device Sleep
  - TRIM
  - Hyper Cache Technology
  - Over-provisioning
  - DataRAID™
- **NAND Flash Type:** 3D TLC (BiCS5)
- **MTBF:** >1,000,000 hours
- **Endurance (in drive writes per day: DWPD)**
  - 60 GB: 2.87 DWPD
  - 120 GB: 2.87 DWPD
  - 240 GB: 2.87 DWPD
- **Temperature Range**
  - Operating:
    Standard: 0°C to 70°C
    Wide: -40°C to 85°C
  - Storage: -40°C to 100°C
- **Supply Voltage**
  - 3.3V ± 5%
  - 1.8V ± 5%
  - 1.2V ± 5%
- **Power Consumption**[1]
  - Active mode (Max.): 380 mA
  - Idle mode: 105 mA
- **SATA Power Management**
  - Partial mode
  - Slumber mode
  - Device Sleep mode
- **Package**
  - 16 x 20, unit : mm
  - 156 Ball
- **Reliability**
  - End-to-End Data Protection
- **Form Factor**
  - JEDEC MO-276
  - Net weight: 1.04g ± 5%
- **Write Protect (optional)**
- **RoHS Compliant**

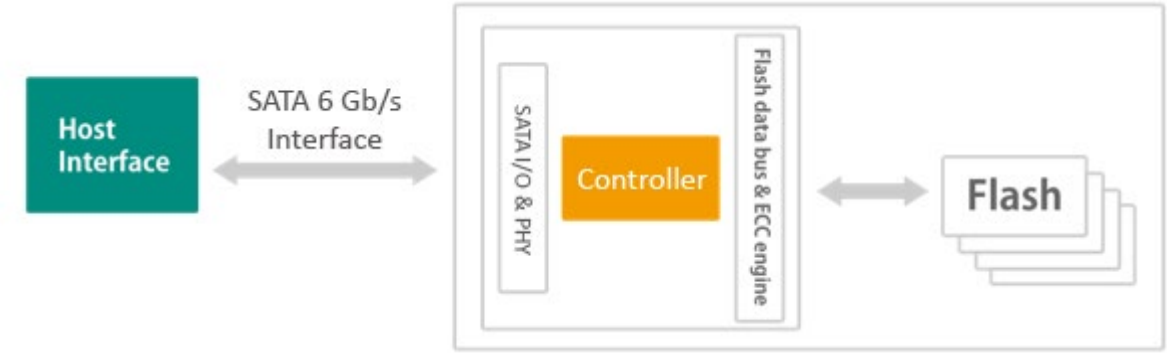
Note:
1. Varies from capacities. The values for performances and power consumptions presented are typical and may vary depending on flash configurations or platform settings.

Table of Contents

1. General Description

Apacer micro SSD (micro SATA Disk Chip, µSSD) presents a revolutionary breakthrough of NAND flash storage technology. This micro sized SSD delivers all the technological benefits in NAND based storage solution with ultra speed SATA 6 Gb/s interface in an embedded BGA form factor, compatible with JEDEC MO-276. Formed in a size of an IC chip, the performance level can reach up to 560 MB/s for read and 470 MB/s for write. With its micro-size and ultra speed, the µSSD is definitely the ideal storage solution for high performance demand mobile devices.

2. Functional Block

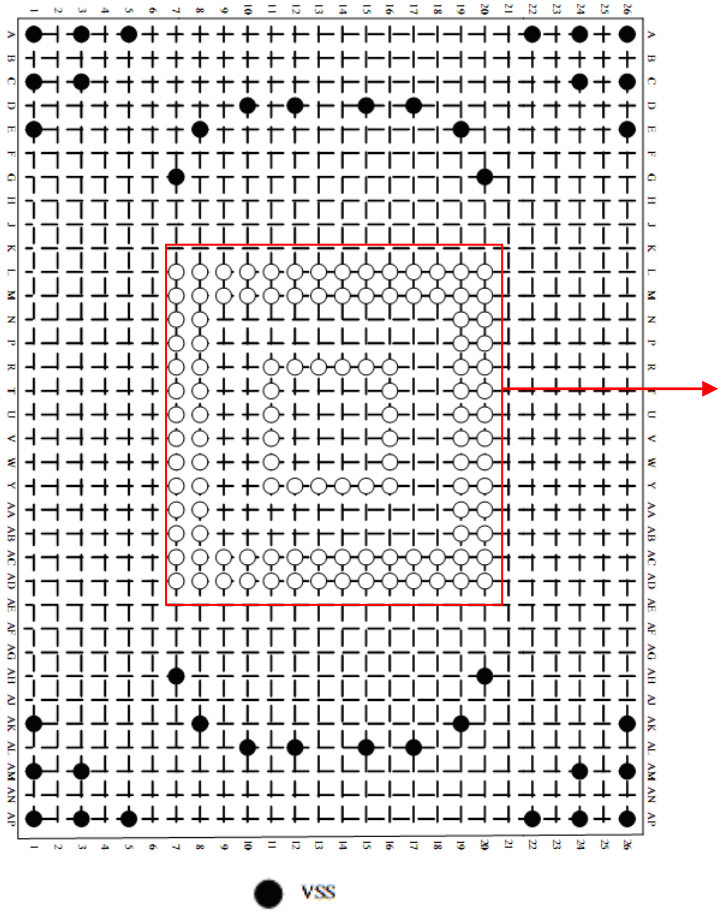


Note: The actual number of NAND flash used on Apacer SV170-µSSD varies from capacities. The illustration is for reference only.

Figure 2-1 Functional Block Diagram

3. Pin Assignments

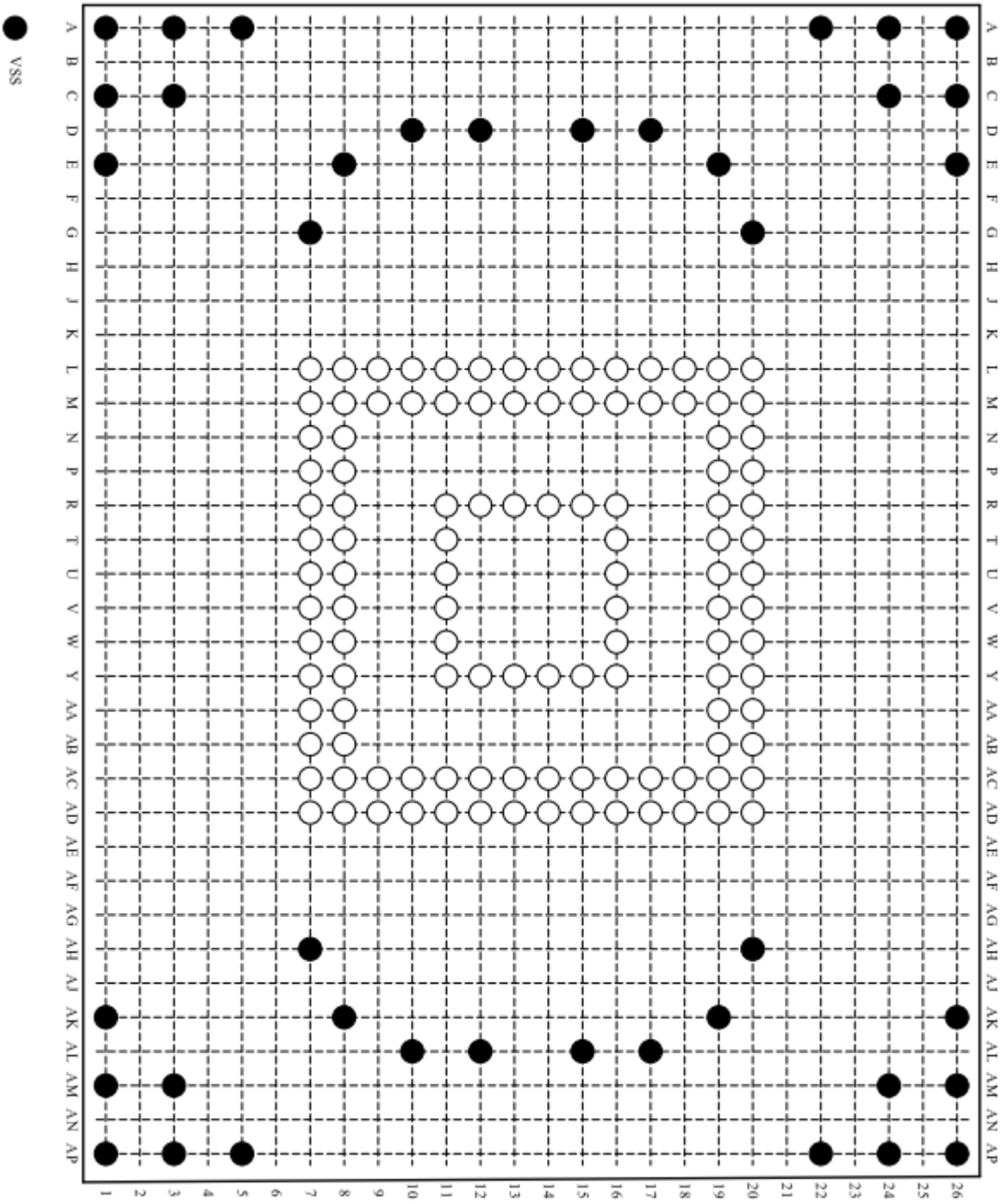
Top View



Pin Allocations

	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
L	VSS	VSS	XTAL_OUT	NC	VSS	VCC	NC	NC	NC	NC	NC	NC	VSS	VSS	L
M	VSS	NC	PWR_RESETN	XTAL_IN	VCC	XTXD	DAS	NC	NC	NC	NC	NC	VSS	VSS	M
N	VSS	VSS											VSS	NC	N
P	SATA_RX_P	VDDC											VSS	VSS	P
R	SATA_RX_N	VDDC			VDDC	VSS	VCC	VCC	VCC	VCC			VCC	VCC	R
T	VSS	VSS			VDDC					VCC			NC	NC	T
U	SATA_TX_N	SATA_VCC			VSS					VCC			VSS	VSS	U
V	SATA_TX_P	SATA_VCC			VCC					VCCQ			VSS	NC	V
W	VSS	NC			VDDC					VCCQ			NC	NC	W
Y	NC	NC			VDDC	VDDC	VDDC	VSS	VSS	VCCQ			VCC	VCC	Y
AA	NC	NC											VCC	XRXD	AA
AB	NC	NC											NC	NC	AB
AC	VSS	VCC	DEVSLP	NC	NC	NC	GPIO6	GPIO2	NC	NC	NC	NC	NC	VSS	AC
AD	VSS	VSS	GPIO3	NC	GPIO7	NC	GPIO13	NC	NC	NC	NC	NC	VSS	VSS	AD
	7	8	9	10	11	12	13	14	15	16	17	18	19	20	

Top View (enlarged image)



Pin Allocations (enlarged image)

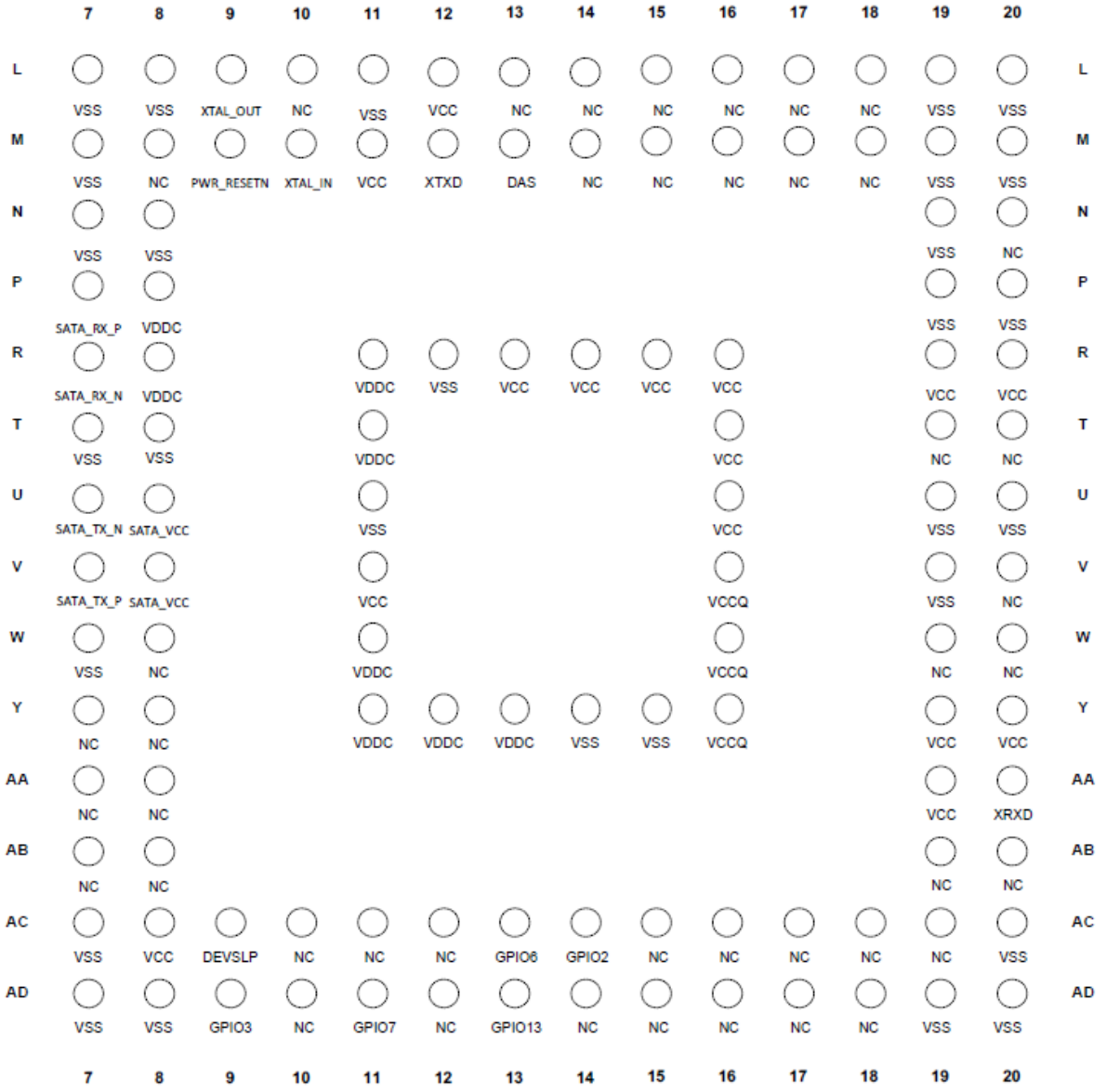


Table 3-1 Pin Description

Name (Bottom view)	BGA156 (Top view)	Type (I/O)	Description
UART/GPIO			
XTXD XRXD	M12 AA20	O I	UART transmit/receive port (For Apacer internal debug use)
GPIO2[1]	AC14	IO	General purpose input/output pins
GPIO3[1]	AD9		
GPIO6[1]	AC13		
GPIO7[1]	AD11		
GPIO13[1]	AD13	IO	VA – Write Protect/Erase/NAS912
SATA Interface Signals			
SATA_RX_N SATA_RX_P	R7 P7	I	Differential signal pair A. SATA device receive signal differential pair
SATA_TX_N SATA_TX_P	U7 V7	O	Differential signal pair B. SATA device transmit signal differential pair
DAS	M13	O	Device activity signal
SATA_VCC	U8, V8		+3.3V
Control Signals			
XTAL_IN XTAL_OUT	M10 L9	I O	Crystal input/output pin (30MHz)
PWR_RESETN	M9	I	Hardware reset, low active
Power Supply Signals			
VCC	L12, M11, R13, R14, R15, R16, R19, R20, T16, U16, V11, Y19, Y20, AA19, AC8		+3.3V
VDDC[2]	W11, Y11, Y12, Y13, P8, R8, R11, T11		+1.2V
VCCQ	V16, W16, Y16		+1.8V
GND Signals			
VSS	R12, U11, L7, L8, M7, N7, T7, W7, L11, L19, L20, M19, M20, N19, P19, AC20, AD20, AD19, AD8, AD7, T8, Y14, Y15, U19, P20, U20, V19, AC7, N8, A1, C1, E1, AK1, AM1		Ground
VSS	AP1, A3, C3, AM3, AP3, A5, AP5, G7, AH7, E8, AK8, D10, AL10, D12, AL12, D15, AL15, D17, AL17, E19, AK19,		Ground

	G20, AH20, A22, AP22, A24, C24, AM24, AP24, A26, C26, E26, AK26, AM26, AP26		
Other Signals			
DEVSLP	AC9	I	Device Sleep, High active. (Normal is low)
NC	L15, L16, L17, L18, AA7, AA8, AB8, AB19, AB20, AC10, AC11, AC12, AC15, AC16, AC17, AC18, AC19, AD10, AD12, AD14, AD15, AD16, AD17, AD18, L10, M16, M17, M8, T19, T20, W19, W8, Y7, Y8, L13, L14, M14, M15, M18, N20, V20, W20,		DNU
Debug	L15, L16, L17, L18, AA8, AD7, AB7		For Apacer internal debug use (AD7, AB7- Standard definition : VSS Apacer definition : for debug)

Notes:
1. The GPIO pins are non-connected by default. For specific configurations for the GPIO pins, such as Apacer Security Features, please consult Apacer product managers or sales representatives for further details.
2. 1.2V and 1.8V power voltages are not required to be supplied by external power source but are provided by SV170-μSSD itself by design.

4. Product Specifications

4.1 Capacity

Capacity specifications of SV170-µSSD are available as shown in Table 4-1. It lists the specific capacity and the default numbers of heads, sectors and cylinders for each product line.

Table 4-1 Capacity Specifications

Capacity	Total bytes	Cylinders	Heads	Sectors	Total LBA
60 GB	60,022,480,896	16,383	16	63	117,231,408
120 GB	120,033,640,448	16,383	16	63	234,441,648
240 GB	240,057,409,536	16,383	16	63	468,862,128

Notes:
- Display of total bytes varies from operating systems.
- 1 GB = 1,000,000,000 bytes; 1 sector = 512 bytes.
- LBA count addressed in the table above indicates total user storage capacity and will remain the same throughout the lifespan of the device. However, the total usable capacity of the SSD is most likely to be less than the total physical capacity because a small portion of the capacity is reserved for device maintenance usages.

4.2 Performance

Performance of SV170-µSSD is listed below in Table 4-2.

Table 4-2 Performance Specifications

Performance \ Capacity	60 GB	120 GB	240 GB
Sequential Read (MB/s)	315	555	560
Sequential Write (MB/s)	190	370	470
4K Random Read (IOPS)	21,000	41,000	67,000
4K Random Write (IOPS)	44,000	74,000	83,000

Notes:
- Results may differ from various flash configurations or host system setting.
- Sequential read/write is based on CrystalDiskMark 5.2.1 with file size 1,000MB.
- Random read/write is measured using IOMeter with Queue Depth 32.

4.3 Environmental Specifications

Environmental specifications of SV170-µSSD product are shown in Table 4-3.

Table 4-3 Environmental Specifications[1]

Item	Specifications
Operating temp.	0°C to 70°C
Non-operating temp.	-40°C to 100°C
ESD (Electrostatic Discharge)[2]	23°C, 49% (RH)
Acoustic	0dB

Notes:
1. This Environmental Specification table indicates the conditions for testing the device. Real world usages may affect the results.
2. Device functions are affected, but EUT will be back to its normal or operational state automatically.

4.4 Mean Time Between Failures (MTBF)

Mean Time Between Failures (MTBF) is predicted based on reliability data for the individual components in SV170-µSSD. The prediction result for SV170-µSSD is more than 1,000,000 hours.

Note: The MTBF is predicated and calculated based on “Telcordia Technologies Special Report, SR-332, Issue 2” method.

4.5 Certification and Compliance

SV170-µSSD complies with the following standards:

- CE
- UKCA
- FCC
- RoHS
- BSMI

4.6 Endurance

The endurance of a storage device is predicted by Drive Writes Per Day based on several factors related to usage, such as the amount of data written into the drive, block management conditions, and daily workload for the drive. Thus, key factors, such as Write Amplifications and the number of P/E cycles, can influence the lifespan of the drive.

Table 4-4 Endurance Specifications

Capacity	Drive Writes Per Day
60 GB	2.87
120 GB	2.87
240 GB	2.87

Notes:
- This estimation complies with JEDEC random client workload.
- Flash vendor guaranteed 3D NAND TLC P/E cycle: 3K
- WAF may vary from capacity, flash configurations and writing behavior on each platform.
- 1 Terabyte = 1,024GB
- DWPD (Drive Writes Per Day) is calculated the number of times that user can overwrite the entire capacity of an SSD per day of its lifetime during the warranty period. (3D NAND TLC warranty: 2 years)

5. Flash Management

5.1 Error Correction/Detection

SV170-μSSD implements a hardware ECC scheme, based on the Low Density Parity Check (LDPC). LDPC is a class of linear block error correcting code which has apparent coding gain over BCH code because LDPC code includes both hard decoding and soft decoding algorithms. With the error rate decreasing, LDPC can extend SSD endurance and increase data reliability while reading raw data inside a flash chip.

5.2 Bad Block Management

Bad blocks are blocks that include one or more invalid bits, and their reliability is not guaranteed. Blocks that are identified and marked as bad by the manufacturer are referred to as “Initial Bad Blocks”. Bad blocks that are developed during the lifespan of the flash are named “Later Bad Blocks”. Thus, this device implements an efficient bad block management algorithm to detect the factory-produced bad blocks and manages any bad blocks that appear with use. This practice further prevents data being stored into bad blocks and improves the data reliability.

5.3 Global Wear Leveling

Flash memory devices differ from Hard Disk Drives (HDDs) in terms of how blocks are utilized. For HDDs, when a change is made to stored data, like erase or update, the controller mechanism on HDDs will perform overwrites on blocks. Unlike HDDs, flash blocks cannot be overwritten and each P/E cycle wears down the lifespan of blocks gradually. Repeatedly program/erase cycles performed on the same memory cells will eventually cause some blocks to age faster than others. This would bring flash storages to their end of service term sooner. Global wear leveling is an important mechanism that levels out the wearing of all blocks so that the wearing-down of all blocks can be almost evenly distributed. This will increase the lifespan of SSDs.

5.4 Power Failure Management

Power Failure Management plays a crucial role when power supply becomes unstable. Power disruption may occur when users are storing data into the SSD, leading to instability in the drive. However, with Power Failure Management, a firmware protection mechanism will be activated to scan pages and blocks once power is resumed. Valid data will be transferred to new blocks for merging and the mapping table will be rebuilt. Therefore, data reliability can be reinforced, preventing damage to data stored in the NAND Flash.

5.5 Flash Translation Layer – Page Mapping

Page mapping is an advanced flash management technology whose essence lies in the ability to gather data, distribute the data into flash pages automatically, and then schedule the data to be evenly written. Page-level mapping uses one page as the unit of mapping. The most important characteristic is that each logical page can be mapped to any physical page on the flash memory device. This mapping algorithm allows different sizes of data to be written to a block as if the data is written to a data pool and it does not need to take extra operations to process a write command. Thus, page mapping is adopted to increase random access speed and improve SSD lifespan, reduce block erase frequency, and achieve optimized performance and lifespan.

5.6 Hyper Cache Technology

Apacer proprietary Hyper Cache technology, a non-volatile SLC write cache, provides excellent performance to handle various scenarios in industrial use.

Using this method, a portion of the available capacity is being treated as SLC (1bit-per-cell) NAND flash memory in the TLC models, two bits per cell technology, consists of a number of low and high pages. Apacer Hyper Cache Technology collects low pages for extraordinary performance, called Hyper Cache mode. And, the rest of high pages are combined together and performs normal TLC performance, called TLC mode. When data is written to SSD, the firmware will direct the data to Hyper Cache mode, thus improving the write speeds drastically.

5.7 ATA Secure Erase

ATA Secure Erase is an ATA disk purging command currently embedded in most of the storage drives. Defined in ATA specifications, (ATA) Secure Erase is part of Security Feature Set that allows storage drives to erase all user data areas. The erase process usually runs on the firmware level as most of the ATA-based storage media currently in the market are built-in with this command. ATA Secure Erase can securely wipe out the user data in the drive and protects it from malicious attack.

5.8 TRIM

TRIM is a feature which helps improve the read/write performance and speed of solid-state drives (SSD). Unlike hard disk drives (HDD), SSDs are not able to overwrite existing data, so the available space gradually becomes smaller with each use. With the TRIM command, the operating system can inform the SSD which blocks of data are no longer in use and can be removed permanently. Thus, the SSD will perform the erase action, which prevents unused data from occupying blocks all the time.

5.9 S.M.A.R.T.

SMART, an acronym for Self-Monitoring, Analysis and Reporting Technology, is an open standard that allows a hard disk drive to automatically detect its health and report potential failures. When a failure is recorded by SMART, users can choose to replace the drive to prevent unexpected outage or data loss. Moreover, SMART can inform users of impending failures while there is still time to perform proactive actions, such as copy data to another device.

5.10 DataRAID™

Apacer's DataRAID algorithm applies an additional level of protection and error-checking. Using this algorithm, a certain amount of space is given over to aggregating and resaving the existing parity data used for error checking. So, in the event that data becomes corrupted, the parity data can be compared to the existing uncorrupted data and the content of the corrupted data can be rebuilt.

5.11 Device Sleep (DevSleep or DEVSLP) Mode

Device Sleep is a feature that allows SATA devices to enter a low power mode by designating a particular pin as DEVSLP signal with an aim to reducing power consumption.

Note: With DEVSLP enabled, power consumption is under 10mW.

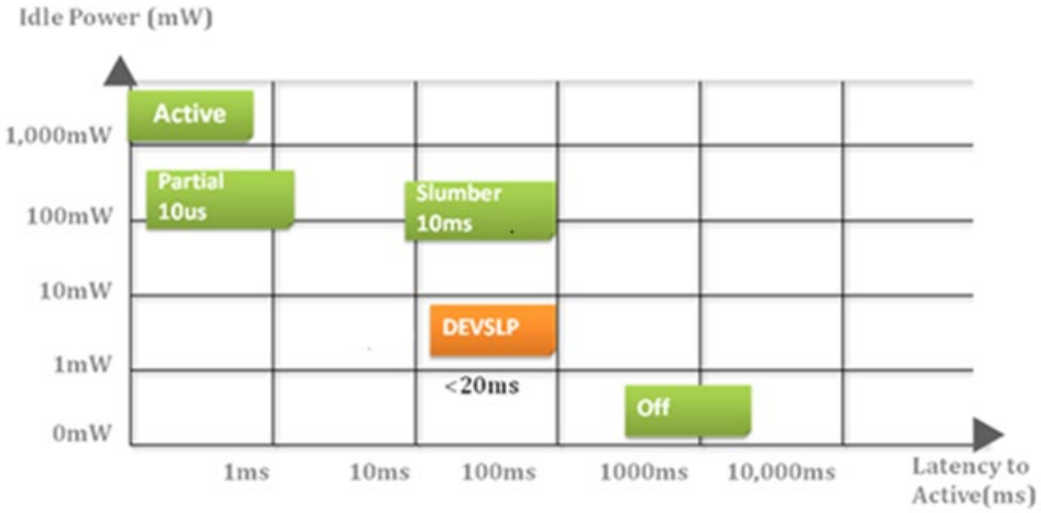


Figure 5-1 Device Sleep

5.12 Over-provisioning

Over-provisioning (OP) is a certain portion of the SSD capacity exclusively for increasing Garbage Collection (GC) efficiency, especially when the SSD is filled to full capacity or performs a heavy mixed-random workload. OP has the advantages of providing extended life expectancy, reliable data integrity, and high sustained write performance.

5.13 SATA Power Management

By complying with SATA 6 Gb/s specifications, the SSD supports the following SATA power saving modes:

- ACTIVE: PHY ready, full power, TX & RX operational
- PARTIAL: Reduces power, resumes in under 10 µs (microseconds)
- SLUMBER: Reduces power, resumes in under 10 ms (milliseconds)
- Device Sleep (DevSleep or DEVSLP): triggered by interface signal, PHY might be powered down, the device in a almost shut down state, consuming less power than Slumber mode, host support required for this mode

Note: The behaviors of power management features would depend on host/device settings.

6. Reliability Features

6.1 End-to-End Data Protection

End-to-End Data Protection is a feature implemented in Apacer SSD products that extends error control to cover the entire path from the host computer to the drive and back, and ensure data integrity at multiple points in the path to enable reliable delivery of data transfers. Unlike ECC which does not exhibit the ability to determine the occurrence of errors throughout the process of data transmission, End-to-End Data Protection allows SSD controller to identify an error created anywhere in the path and report the error to the host computer before it is written to the drive. This error-checking and error-reporting mechanism therefore guarantees the trustworthiness and reliability of the SSD.

7. Software Interface

7.1 Command Set

This section defines the software requirements and the format of the commands the host sends to SV170-µSSD. Commands are issued to SV170-µSSD by loading the required registers in the command block with the supplied parameters, and then writing the command code to the Command register.

Table 7-1 Command Set

Code	Command	Code			Command
00h	NOP	C9h			READ DMA WITHOUT RETRY
06h	DATA SET MANAGEMENT	CAh			WRITE DMA
10h-1Fh	RECALIBRATE	CBh			WRITE DMA WITHOUT RETRY
20h	READ SECTORS	CEh			WRITE MULTIPLE FUA EXT
21	READ SECTORS WITHOUT RETRY	E0h			STANDBY IMMEDIATE
24h	READ SECTORS EXT	E1h			IDLE IMMEDIATE
25h	READ DMA EXT	E2h			STANDBY
27h	READ NATIVE MAX ADDRESS EXT	E3h			IDLE
29h	READ MULTIPLE EXT	E4h			READ BUFFER
2Fh	READ LOG EXT	E5h			CHECK POWER MODE
30h	WRITE SECTORS	E6h			SLEEP
31h	WRITE SECTORS WITHOUT RETRY	E7h			FLUSH CACHE
34h	WRITE SECTORS EXT	E8h			WRITE BUFFER
35h	WRITE DMA EXT	E9h			READ BUFFER DMA
37h	SET NATIVE MAX ADDRESS EXT	EAh			FLUSH CACHE EXT
38h	CFA WRITE SECTORS WITHOUT	EBh			WRITE BUFFER DMA
39h	WRITE MULTIPLE EXT	ECh			IDENTIFY DEVICE
3Dh	WRITE DMA FUA EXT	EFh			SET FEATURES
3Fh	WRITE LONG EXT	EFh	02h		ENABLE VOLATILE WRITE CACHE
40h	READ VERIFY SECTORS	EFh	03h		SET TRANSFER MODE
41h	READ VERIFY SECTORS WITHOUT RETRY	EFh	05h		ENABLE THE APM FEATURE SET
42h	READ VERIFY SECTORS EXT	EFh	10h		ENABLE USE OF SATA FEATURE SET
44h	ZERO EXT	EFh	10h	02h	ENABLE DMA SETUP FIS AUTO-ACTIVATE OPTIMIZATION
45h	WRITE UNCORRECTABLE EXT	EFh	10h	03h	ENABLE DEVICE-INITIATED INTERFACE POWER STATE

Code		Command	Code			Command
47h		READ LOG DMA EXT	EFh	10h	06h	ENABLE SOFTWARE SETTINGS PRESERVATION (SSP)
57h		WRITE LOG DMA EXT	EFh	10h	07h	ENABLE DEVICE AUTOMATIC PARTIAL TO SLUMBER TRANSITIONS
60h		READ FPDMA QUEUED	EFh	10h	09h	ENABLE DEVICE SLEEP
61h		WRITE FPDMA QUEUED	EFh	55h		DISABLE READ LOOK-AHEAD
70h-7Fh		SEEK	EFh	66h		DISABLE REVERTING TO POWER-ON DEFAULTS
90h		EXECUTE DEVICE DIAGNOSTIC	EFh	82h		DISABLE VOLATILE WRITE
91h		INITIALIZE DEVICE PARAMETERS	EFh	85h		DISABLE THE APM FEATURE
92h		DOWNLOAD MICROCODE	EFh	90h		DISABLE USE OF SATA FEATURE SET
93h		DOWNLOAD MICROCODE DMA	EFh	90h	02h	DISABLE DMA SETUP FIS AUTO-ACTIVATE OPTIMIZATION
B0h		SMART	EFh	90h	03h	DISABLE DEVICE-INITIATED INTERFACE POWER STATE
B0h	D0h	SMART READ DATA	EFh	90h	06h	DISABLE SOFTWARE SETTINGS PRESERVATION
B0h	D1h	SMART READ ATTRIBUTE THRESHOLDS	EFh	90h	07h	DISABLE DEVICE AUTOMATIC PARTIAL TO SLUMBER
B0h	D2h	SMART ENABLE/DISABILE ATTRIBUTE AUTOSAVE	EFh	90h	09h	DISABLE DEVICE SLEEP
B0h	D3h	SMART SAVE ATTRIBUTE VALUES	EFh	AAh		ENABLE READ LOOK-AHEAD
B0h	D4h	SMART EXECUTE OFF-LINE IMMEDIATE	EFh	CCh		ENABLE REVERTING TO POWER-ON DEFAULTS
B0h	D5h	SMART READ LOG	F1h			SECURITY SET PASSWORD
B0h	D6h	SMART WRITE LOG	F2h			SECURITY UNLOCK
B0h	D8h	SMART ENABLE OPERATIONS	F3h			SECURITY ERASE PREPARE
B0h	D9h	SMART DISABLE OPERATIONS	F4h			SECURITY ERASE UNIT
B0h	DAh	SMART RETURN STATUS	F5h			SECURITY FREEZE LOCK
B0h	DBh	SMART ENABLE/DISABILE AUTOMATIC OFF-LINE	F6h			SECURITY DISABLE PASSWORD
B1h		DEVICE CONFIGURATION	F8h			READ NATIVE MAX ADDRESS
B4h		SANITIZE	F9h			SET MAX ADDRESS
C4h		READ MULTIPLE	F9h	01h		SET MAX SET PASSWORD
C5h		WRITE MULTIPLE	F9h	02h		SET MAXLOCK
C6h		SET MULTIPLE MODE	F9h	03h		SET MAX UNLOCK
C8h		READ DMA	F9h	04h		SET MAX FREEZE LOCIK

7.2 S.M.A.R.T.

SMART, an acronym for Self-Monitoring, Analysis and Reporting Technology, is an open standard that allows a hard disk drive to automatically detect its health and report potential failures. When a failure is recorded by SMART, users can choose to replace the drive to prevent unexpected outage or data loss. Moreover, SMART can inform users of impending failures while there is still time to perform proactive actions, such as copy data to another device.

Table 7-2 SMART Subcommand Set

Code	SMART Subcommand
D0h	READ DATA
D1h	READ ATTRIBUTE THRESHOLDS
D2h	ENABLE/DISABLE ATTRIBUTE AUTOSAVE
D4h	EXECUTE OFF-LINE IMMEDIATE
D5h	SMART READ LOG
D6h	SMART WRITE LOG
D8h	ENABLE OPERATIONS
D9h	DISABLE OPERATIONS
DAh	RETURN STATUS

Table 7-3 General SMART Attribute Structure

Byte	Description
0	ID (Hex)
1 – 2	Status Flag
3	Value
4	Worst
5*-11	Raw Data

*Byte 5: LSB

Table 7-4 SMART Attribute ID List

ID (Hex)	Attribute Name
9 (0x09)	Power-on Hours
12 (0x0C)	Power Cycle Count
163 (0xA3)	Max. Erase Count
164 (0xA4)	Avg. Erase Count
166 (0xA6)	Total Later Bad Block Count
167 (0xA7)	SSD Protect Mode (Vendor Specific)
168 (0xA8)	SATA PHY Error Count
171 (0xAB)	Program Fail Count
172 (0xAC)	Erase Fail Count
175 (0xAF)	Bad Cluster Table Count
192 (0xC0)	Unexpected Power Loss Count
194 (0xC2)	Temperature
231 (0xE7)	Lifetime Left
241 (0xF1)	Total Sectors of Write

Note: For SSD with no thermal sensor design, or if temperature data is not retrievable from the installed sensor, the default temperature value for this attribute is set to 30°C.

8. Electrical Specifications

8.1 Operating Voltage

Table 8-1 lists the supply voltage for SV170-µSSD.

Table 8-1 Operating Range

Parameter	Voltage	Range
VCC	3.3V	3.135V ~ 3.465V
VCCQ	1.8V	1.71V ~ 1.89V
VDDC	1.2V	1.14V ~ 1.26V

8.2 Power Consumption

Table 8-2 lists the power consumption for SV170-µSSD.

Table 8-2 Power Consumption Based on 3.3V (Unit: mA)

Mode \ Capacity	60 GB	120 GB	240 GB
Active (Max.)	270	350	380
Idle	100	100	105

Notes:
- All values are typical and may vary depending on flash configurations or host system settings.
- Power consumption is measured using CrystalDiskMark 5.2.1.

9. Mechanical Specifications

9.1 Dimensions

Top View

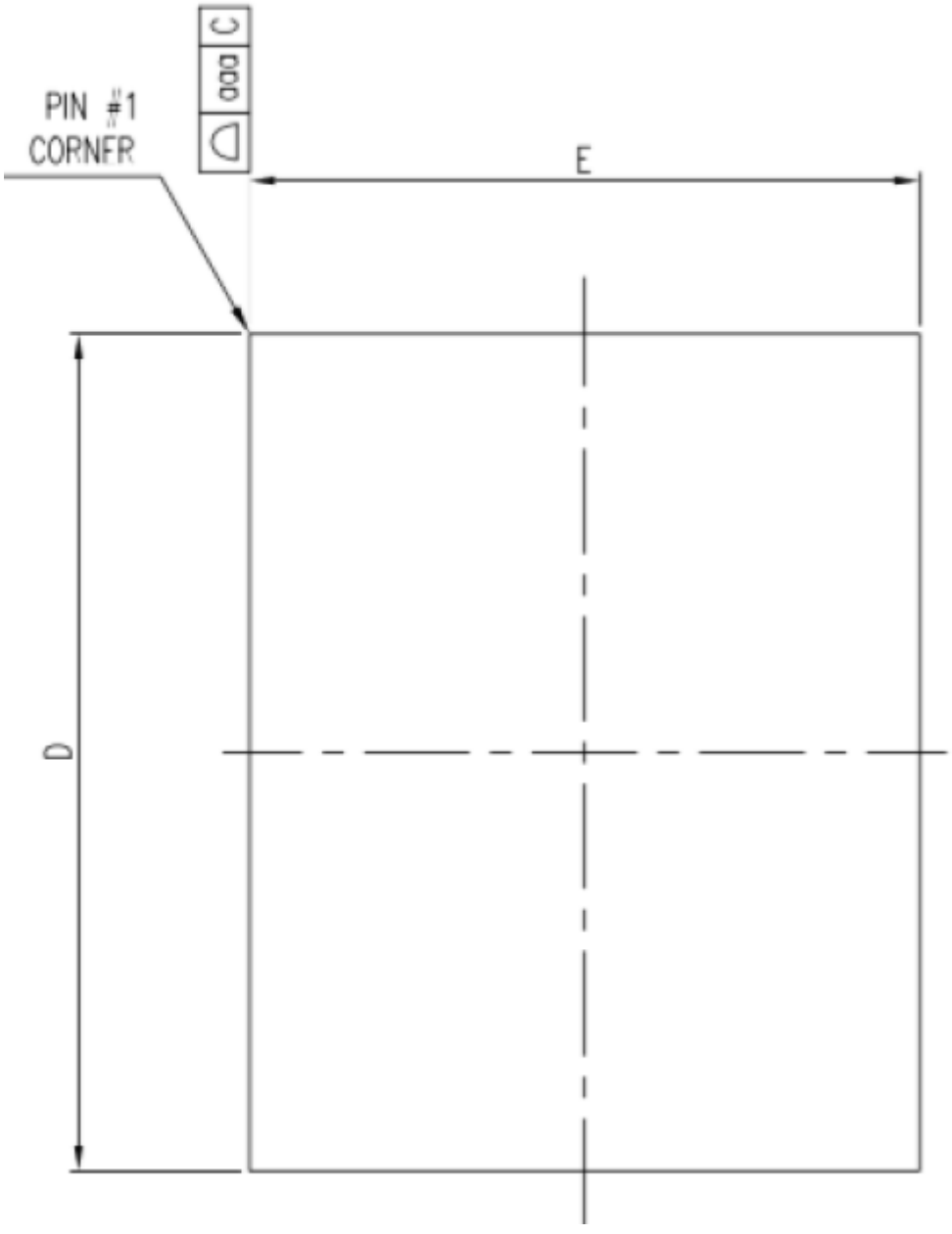


Figure 9-1 Dimensions – Top View

Bottom View

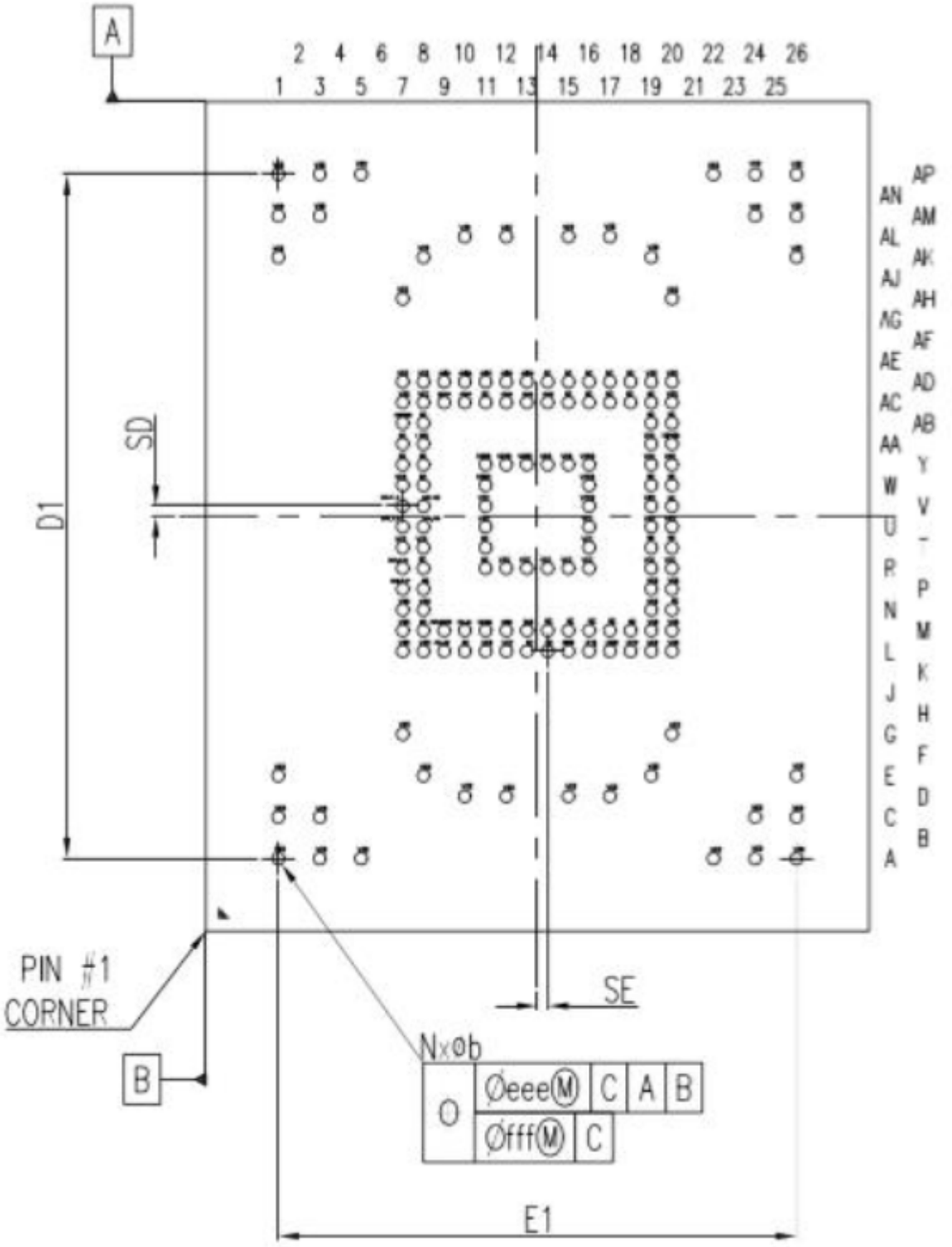


Figure 9-2 Dimensions – Bottom View

Side View

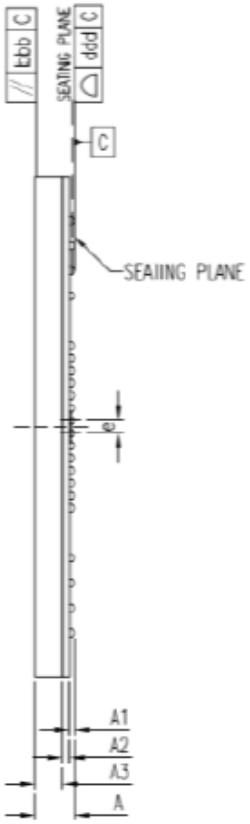


Figure 9-3 Dimensions – Side View

	SYMBOL	DIMENSION IN MM		
		MIN.	NOM.	MAX.
TOTAL THICKNESS	A	1.45	1.57	1.70
STAND OFF	A1	0.16	0.21	0.26
SUBSTRATE THICKNESS	A2		0.26	
MOLD THICKNESS	A3		1.10	
BODY SIZE	D		20	
	E		16	
BALL DIAMETER			0.30	
BALL OPENING			0.275	
BALL WIDTH	b	0.25	0.30	0.35
BALL PITCH	e		0.50	
BALL COUNT	n		156	
EDGE BALL CENTER TO CENTER	D1		16.50 BSC.	
	E1		12.50 BSC.	
BODY CENTER TO CONTACT BALL	SD		0.25 BSC.	
	SE		0.25 BSC.	
JEDEC(REF)			MO-276(REF.)	
PACKAGE EDGE TOLERANCE	aaa		0.15	
MOLD FLATNESS	bbb		0.20	
COPLANARITY	ddd		0.08	
BALL OFFSET(PACKAGE)	eee		0.15	
BALL OFFSET(BALL)	fff		0.05	

9.2 Write Protect (optional)

Apacer implements the Virtual Write scheme that allows write commands to go through the flash controller and data temporarily stored, but no data has been actually written into the flash. Once the system is reset and rebooted, the temporarily stored data will be lost and nowhere to be found in the system. Since the Virtual Write scheme runs at device level, it requires no software or driver installation and is independent from the host OS.

9.3 Net Weight

Table 9-1 Net Weight

Capacity	Net Weight (g ± 5%)
60GB	1.02
120GB	1.04
240GB	1.04

Note: The values given here are for reference only. Please weigh your product for the actual value.

10. Product Ordering Information

10.1 Product Code Designations

Apacer's SV170-µSSD is available in different configurations and densities. See the chart below for a comprehensive list of options for the SV170-µSSD series devices.

Code	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	A	B	6	.	1	7	5	X	X	A	.	X	X	X	X	X

Code 1-3 (Product Line & Form Factor)	SV170-µSSD
Code 5-6 (Model/Solution)	SV170
Code 7-8 (Product Capacity)	5G: 60GB 5H: 120GB 5J: 240GB
Code 9 (Flash Type & Product Temp)	G: 3D TLC Standard temperature H: 3D TLC Wide temperature
Code 10 (Product Spec)	µSSD
Code 12-14 (Version Number)	Random numbers generated by system
Code 15-16 (Firmware Version)	15: With Write Protect 16: Without Write Protect

10.2 Valid Combinations

The following tables list the available models of the SV170-µSSD series which are in mass production or will be in mass production. Consult your Apacer sales representative to confirm availability of valid combinations and to determine availability of new combinations.

10.2.1 Without Write Protect

Capacity	Standard Temperature	Top Side Marking
60GB	AB6.175GGA.00216	SHAF-60GBC11D
120GB	AB6.175HGA.00216	SHAF-120BC22D
240GB	AB6.175JGA.00116	SHAF-240BC24D

Capacity	Wide Temperature	Top Side Marking
60GB	AB6.175GHA.00216	SHAF-60GBE11D
120GB	AB6.175HHA.00216	SHAF-120BE22D
240GB	AB6.175JHA.00116	SHAF-240BE24D

10.2.2 With Write Protect

Capacity	Standard Temperature	Top Side Marking
60GB	AB6.175GGA.00215	SHAF-60GBE11D
120GB	AB6.175HGA.00215	SHAF-120BC22D
240GB	AB6.175JGA.00115	SHAF-240BE24D

Capacity	Wide Temperature	Top Side Marking
60GB	AB6.175GHA.00215	SHAF-60GBE11D
120GB	AB6.175HHA.00215	SHAF-120BC22D
240GB	AB6.175JHA.00115	SHAF-240BE24D

Revision History

Revision	Description	Date
1.0	Initial release	4/1/2022
1.1	Added 120GB and 240GB support	4/7/2022
1.2	Updated endurance rating for 120-240GB at Endurance on Specifications Overview page and Table 4-4	5/10/2022
1.3	Updated endurance rating at Endurance on Specifications Overview page and Table 4-4	5/11/2022
1.4	- Added wide temperature support - Added UKCA to 4.5 Certification and Compliance - Updated 10. Product Ordering Information by adding wide-temp and top side marking information	2/16/2023

Global Presence

Taiwan (Headquarters)
Apacer Technology Inc.
1F., No.32, Zhongcheng Rd., Tucheng Dist.,
New Taipei City 236, Taiwan R.O.C.
Tel: 886-2-2267-8000
Fax: 886-2-2267-2261
amtsales@apacer.com

U.S.A.
Apacer Memory America, Inc.
46732 Lakeview Blvd., Fremont, CA 94538
Tel: 1-408-518-8699
Fax: 1-510-249-9551
sa@apacerus.com

Japan
Apacer Technology Corp.
6F, Daiyontamachi Bldg., 2-17-12, Shibaura, Minato-Ku,
Tokyo, 108-0023, Japan
Tel: 81-3-5419-2668
Fax: 81-3-5419-0018
jpservices@apacer.com

Europe
Apacer Technology B.V.
Science Park Eindhoven 5051 5692 EB Son,
The Netherlands
Tel: 31-40-267-0000
Fax: 31-40-290-0686
sales@apacer.nl

China
Apacer Electronic (Shanghai) Co., Ltd
Room D, 22/FL, No.2, Lane 600, JieyunPlaza,
Tianshan RD, Shanghai, 200051, China
Tel: 86-21-6228-9939
Fax: 86-21-6228-9936
sales@apacer.com.cn

India
Apacer Technologies Pvt Ltd,
1874, South End C Cross, 9th Block Jayanagar,
Bangalore-560069, India
Tel: 91-80-4152-9061/62
Fax: 91-80-4170-0215
sales_india@apacer.com