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SG6 SERIES
CLIENT SSD

SSD

SG6 Series is a Client SATA SSD lineup using 64-layer, 3-bit-per-cell (TLC) BiCS FLASH™.

The SG6 series SSDs with up to 1024GB capacity, delivers performance of up to 550MB/s sequential read and 535MB/s sequential write. Furthermore, active power consumption was decreased by up to 40% compared to previous SG5 series, enabling increased battery life for mobile computing.

Offered in both traditional 2.5-type (7mm height) and compact M.2 2280 form factors, SG6 series is engineered for mainstream desktop PCs and notebook PCs, consumer upgrades, as well as applications needing data security with an option of self-encrypting drive (SED) models.

Product image may represent a design model

KEY FEATURES
- 64-layer, 3-bit-per-cell (TLC) BiCS FLASH™
- Capacities up to 1024GB
- SATA Revision 3.3, 6.0 Gbit/s interface
- 2.5-type and M.2 2280 form factor options
- TCG Opal Version 2.01 (SED model)

APPLICATIONS
- Desktop PCs
- Notebook PCs

SPECIFICATIONS

Standard Models		2.5-type (7.0 mm height)			M.2 2280-S2 Single-sided		M.2 2280-D2 Double-sided
Model Number	(Non-SED)	KSG60ZSE256G	KSG60ZSE512G	KSG60ZSE1T02	KSG60ZMV256G	KSG60ZMV512G	KSG60ZM81T02
	(SED)	KSG6AZSE256G	KSG6AZSE512G	KSG6AZSE1T02	KSG6AZMV256G	KSG6AZMV512G	KSG6AZM81T02
Memory		TLC (BiCS FLASH™)					
Interface		SATA Rev. 3.3					
Maximum Speed		6.0 Gbit/s					
Command		ACS-4					
Connector Type		Standard SATA			M.2 B-M		
Formatted Capacity[1]		256 GB	512 GB	1024 GB	256 GB	512 GB	1024 GB
Performance[2] (Up to)	Sequential Read	550 MB/s {524 MiB/s}			550 MB/s {524 MiB/s}		
	Sequential Write	340 MB/s {324 MiB/s}	535 MB/s {510 MiB/s}		340 MB/s {324 MiB/s}	535 MB/s {510 MiB/s}	
Supply Voltage		5.0 V ±5 %			3.3 V ±5 %		
Power Consumption	Active	2.3 W typ.	3.1 W typ.	3.5 W typ.	2.3 W typ.	3.1 W typ.	3.5 W typ.
	Idle	60 mW typ.	65 mW typ.	70 mW typ.	55 mW typ.	60 mW typ.	65 mW typ.
	DevSleep	6 mW max.			5 mW max.		
Size		100.0 mm x 69.85 mm x 7.0 mm			80.0 mm x 22.0 mm x 2.23 mm		80.0 mm x 22.0 mm x 3.58 mm
Weight		41 g typ.	42 g typ.	43 g typ.	6.9 g typ.		8.3 g typ.

Standard Models		2.5-type (7.0 mm Height)	M.2 2280-S2 Single-sided	M.2 2280-D2 Double-sided
Tempera-ture	Operating	0 to 70 °C (Case Temperature)	0 to 80 °C (Components Temperature)	
	Non-operating	-40 to 85 °C		
Reliability[3]		Mean Time to Failure (MTTF): 1,500,000 hours Product Life: Approximately 5 years		
More Features		Strong & highly-efficient ECC named QSBC™ is supported. Firmware security feature (only digitally signed firmware can be installed) is supported.		
Compliance		UL, cUL, TÜV, KC, FCC, BSMI, CE, RCM, ISED, VCCI, Moroccan conformity mark		

Note: 1) Definition of capacity: Toshiba Memory Corporation defines 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.

2) 1 MiB (mebibyte) = 2^{20} bytes = 1,048,576 bytes, and 1 MB (megabyte) = 1,000,000 bytes.

3) 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.

* Product image may represent a design model.
* Read and write speed may vary depending on the host device, read and write conditions, and file size.
* Company names, product names, and service names mentioned herein may be trademarks of their respective companies.

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› ORDERING INFORMATION

K	XX	X	X	X	X	X	XXXX
1	2	3	4	5	6	7	8

1.	Product Name	K: SSD product
2.	Prodct Category	SG: SG Series
3.	Development Generation	6: Generation 6
4.	Option Code 1	0: Non-SED
		A: SED
5.	Option Code 2	Z: No-option
6.	Connector Type	S: Standard SATA
		M: M.2 B-M
7.	Form Factor	E: 2.5-type 7 mm H
		V: M.2 2280 Single Sided
		8: M.2 2280 Double Sided
8.	Capacity	256G / 512G /1T02
		256G is 256 GB, 512G is 512 GB and 1T02 is 1024 GB (1 GB = 1,000,000,000 bytes)

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> PRODUCT LINE UP

Model Number	Formatted Capacity	Form Factor/Connect Type	Function Note
KSG60ZSE256G	256 GB	2.5-type[1] Standard SATA	Non-SED
KSG60ZSE512G	512 GB		
KSG60ZSE1T02	1,024 GB		
KSG6AZSE256G	256 GB		SED
KSG6AZSE512G	512 GB		
KSG6AZSE1T02	1,024 GB		
KSG60ZMV256G	256 GB	M.2 2280-S2[2] -B-M	Non-SED
KSG60ZMV512G	512 GB		
KSG60ZM81T02	1,024 GB	M.2 2280-D2[3] -B-M	
KSG6AZMV256G	256 GB	M.2 2280-S2[2] -B-M	SED
KSG6AZMV512G	512 GB		
KSG6AZM81T02	1,024 GB	M.2 2280-D2[3] -B-M	

Note: 1) 7mm Height
2) Single Sided
3) Double Sided

> CAPACITY

Capacity	Total Number of User Addressable Sectors in LBA Mode
	512 bytes sector
256 GB	500,118,192
512 GB	1,000,215,216
1,024 GB	2,000,409,264

Note: 1 GB (Gigabyte) = 1,000,000,000 bytes

> PERFORMANCE

Standard Models	KSG60ZSE256G KSG6AZSE256G KSG60ZMV256G KSG6AZMV256G	KSG60ZSE512G KSG6AZSE512G KSG60ZMV512G KSG6AZMV512G	KSG60ZSE1T02 KSG6AZSE1T02 KSG60ZM81T02 KSG6AZM81T02
Interface Speed	6.0 Gbit/s max.		
Sequential Read[1] (Up to)	550 MB/s {524 MiB/s}		
Sequential Write[1] (Up to)	340 MB/s {324 MiB/s}	535 MB/s {510 MiB/s}	535 MB/s {510 MiB/s}

Note: 1) Under the condition of measurement with 128 KiB unit sequential access and 4KiB align and queue depth is 32.
(1KiB=1024 bytes.)

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❯ SUPPLY VOLTAGE

Standard Models	2.5-type	M.2 2280 Module
Allowable voltage	5.0 V ±5 %	3.3 V ±5 %
Allowable noise/ripple	100 mV p-p or less	
Allowable supply rise time	2 –100 ms	

Note: The drive has over current protection circuit. (Rated current: 3.15A)

❯ POWER CONSUMPTION

Operation (Ta[1]=25°C)	2.5-type					
	KSG60ZSE256G	KSG6AZSE256G	KSG60ZSE512G	KSG6AZSE512G	KSG60ZSE1T02	KSG6AZSE1T02
Read[2]	2.0 W typ.	2.1 W typ.	2.1 W typ.	2.2 W typ.	2.2 W typ.	2.3 W typ.
Write[2]	2.3 W typ.		3.1 W typ.		3.5 W typ.	
Idle 3[3][4]	60 mW typ.		65 mW typ.		70 mW typ.	
Standby[3][4]	60 mW typ.		65 mW typ.		70 mW typ.	
Sleep[3]	60 mW typ.		65 mW typ.		70 mW typ.	
DevSleep	6 mW max.					

Operation (Ta [1]=25°C)	M.2 2280 Module					
	KSG60ZMV256G	KSG6AZMV256G	KSG60ZMV512G	KSG6AZMV512G	KSG60ZM81T02	KSG6AZM81T02
Read[2]	2.0 W typ.	2.1 W typ.	2.1 W typ.	2.2 W typ.	2.2 W typ.	2.3 W typ.
Write[2]	2.3 W typ.		3.1 W typ.		3.5 W typ.	
Idle 3[3][4]	55 mW typ.		60 mW typ.		65 mW typ.	
Standby[3][4]	55 mW typ.		60 mW typ.		65 mW typ.	
Sleep[3]	55 mW typ.		60 mW typ.		65 mW typ.	
DevSleep	5 mW max.					

Note: 1) Ambient Temperature
2) The values are specified at the condition causing maximum power consumption, i.e., maximum workload, default maximum parallel number of flash memory operation and no thermal control effect.
3) The values are based on using SATA power management features. The Slumber mode is used for the power consumption measurements.
4) The drive may internally write to flash memory. Therefore, drive power consumption may temporally change up to write power.

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ENVIRONMENTAL CONDITIONS

❯ TEMPERATURE

Condition	Range		Gradient
	2.5-type	M.2 2280 Module	
Operating[1]	0 °C (Tc) – 70 °C (Tc) (Case Temperature)	0 °C (Tc) – 80 °C (Tc) (Components Temperature)	30 °C (Ta) / h maximum
Non-operating	-40 °C – 85 °C		30 °C / h maximum
Under Shipment[2]	-40 °C – 85 °C		30 °C / h maximum

Note: 1) Ta: Ambient Temperature, Tc: Case or Components Temperature
2) Packaged in Toshiba Memory Corporation's original shipping package

❯ HUMIDITY

Condition	Range
Operating	8 % – 90 % R.H. (No condensation)
Non-operating	8 % – 95 % R.H. (No condensation)
Under Shipment[1]	5 % – 95 % R.H.
Max. wet bulb	32.5 °C (Operating) 40.0 °C (Non-operating / Shipping)

Note: 1) Packaged in Toshiba Memory Corporation's original shipping package

❯ SHOCK

Condition	Range
Operating Non-operating	14.709 km/s^2 {1,500 G}, 0.5 ms half sine wave
Under Shipment[1]	100 cm free drop

Note: 1) Apply shocks in each direction of the drive's three mutually perpendicular axes, one axis at a time.
Packaged in Toshiba Memory Corporation's original shipping package

❯ VIBRATION

Condition	Range
Operating Non-operating	196 m/s^2 {20 G} Peak, 10 - 2,000 Hz (20 minutes per axis) x 3 axis

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COMPLIANCE

› SAFETY / EMI STANDARDS

Title	Description	Region
UL (Underwriters Laboratories)	UL 60950-1	USA[1]
cUL (Underwriters Laboratories of Canada)	CSA-C22.2 No.60950-1-07	Canada
TÜV (Technischer Überwachungs Verein)	EN 60950-1	EURO
KC	KN32, KN35	Korea
FCC	FCC part 15 Subpart B	USA
BSMI (Bureau of Standards, Metrology and Inspection)	CNS13438 (CISPR Pub. 22)	Taiwan
CE	EN 55032, EN 55024	EURO
RCM	AS/NZS CISPR 32	Australia, New Zealand
ISED	ICES-003	Canada
VCCI	Class B	Japan
Moroccan conformity mark	NM E55024	Morocco

Note: 1) UL certification is basically on a voluntary basis.

› RELIABILITY

Parameter	Value
Mean Time to Failure	1,500,000 hours
Product Life	Approximately 5 years

Products and specifications discussed herein are for reference purposes only and are subject to change without notice. All information discussed herein is provided on an "as is" basis, without warranties of any kind. Before creating and producing designs and using, customers must refer to and comply with the latest versions of the product specifications.

Client SSD SG6 Series Brochure Rev.1.00

MECHANICAL SPECIFICATIONS

2.5 TYPE

Model Number	Weight	Width	Height	Length
KSG60ZSE256G KSG6AZSE256G	41 g typ.			
KSG60ZSE512G KSG6AZSE512G	42 g typ.	69.85 mm	7.0 mm	100.0 mm
KSG60ZSE1T02 KSG6AZSE1T02	43 g typ.			
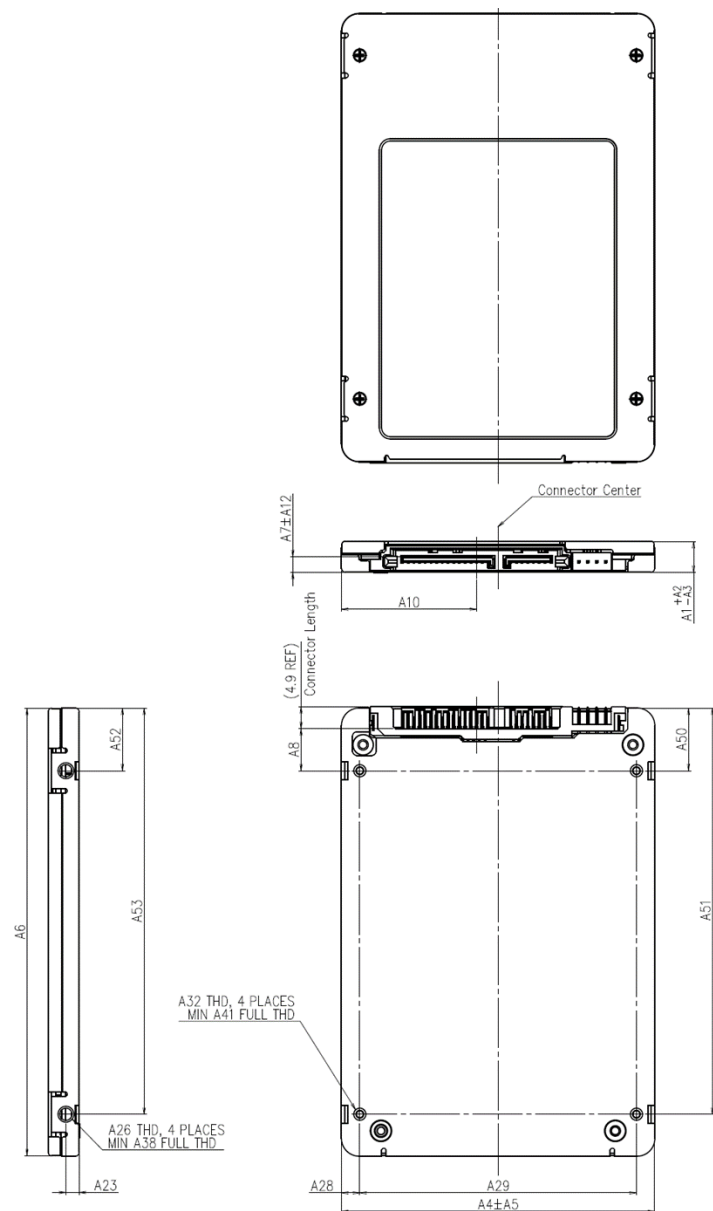
Figure 1: Dimensions of KSG6xZSExxxx (2.5-type)

DIMENSIONS OF KSG6xZSExxxx

| Dimension	SFF-8200 Rev3.2[1] SFF-8201 Rev3.3 SFF-8223 Rev2.5		SG6 Series SSD (Differences only)	
	Millimeters	Inches	Millimeters	Inches
A1	7.00	0.276		
A2	0.20	0.008	0.00	0.000
A3	0.50	0.020		
A4	69.85	2.750		
A5	0.25	0.010		
A6[2]	100.45*	3.955*	100.00 ± 0.41	3.937 ± 0.016
A7	3.5	0.138		
A8	9.40	0.370	9.40 ± 0.51	0.370 ± 0.020
A10[3]	-	-	30.125 ± 0.28	1.186 ± 0.011
A12	0.38	0.015		
A23	3.00	0.118	3.00 ± 0.20	0.118 ± 0.007
A26	M3	N/A		
A28	4.07	0.160	4.07 + 0.295/-0.305	0.060 +0.011/-0.012
A29	61.72	2.430	61.72 ± 0.25	2.430 ± 0.010
A32	M3	N/A		
A38	3#	3#		
A41	2.5#	2.5#		
A50[2]	14.00	0.551	14.00 ± 0.25	0.551 ± 0.010
A51[2]	90.60	3.567	90.60 ± 0.30	3.567 ± 0.012
A52[2]	14.00	0.551	14.00 ± 0.25	0.551 ± 0.010
A53[2]	90.60	3.567	90.60 ± 0.30	3.567 ± 0.012

* = maximum

\# = minimum number of threads

Note: 1) SFF-8200: Small Form Factor Standard
2) PCA, Connector not included
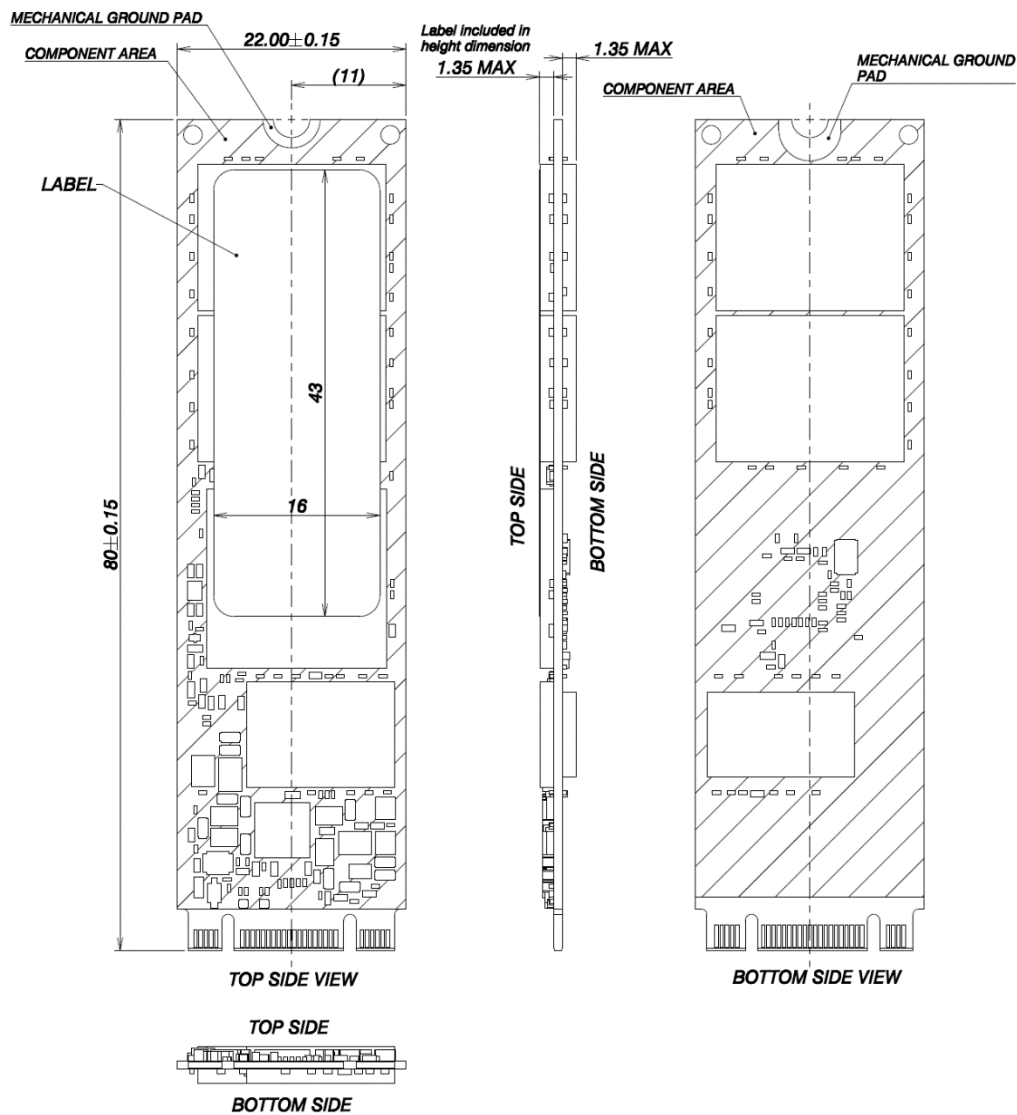3) Connector center defined the same as SFF-8223 All

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> **M.2 2280 MODULE**

Model Number	Weight	Width	Height	Length
KSG60ZMV256G KSG6AZMV256G	6.9 g typ.	22.00 mm	2.23 mm	80.00 mm
KSG60ZMV512G KSG6AZMV512G	6.9 g typ.			
KSG60ZM81T02 KSG6AZM81T02	8.3 g typ.		3.58 mm	
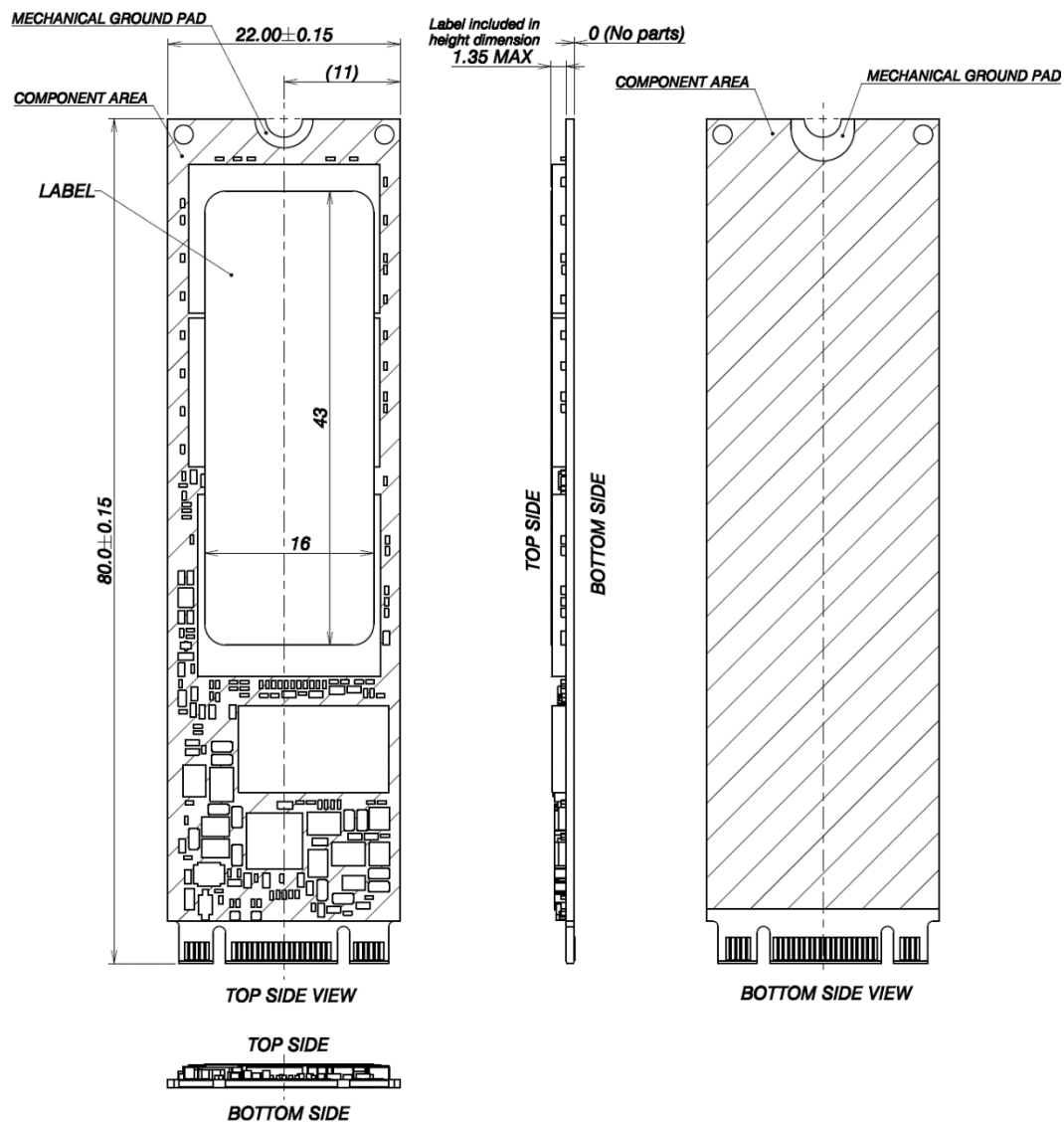
Unit:mm

Figure 2: Dimensions of KSG6xZMVxxxx (M.2 2280-S2 Module)

Unit:mm

Figure 3: Dimensions of KSG6xZM81T02 (M.2 2280-D2 Module)

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INTERFACE CONNECTOR
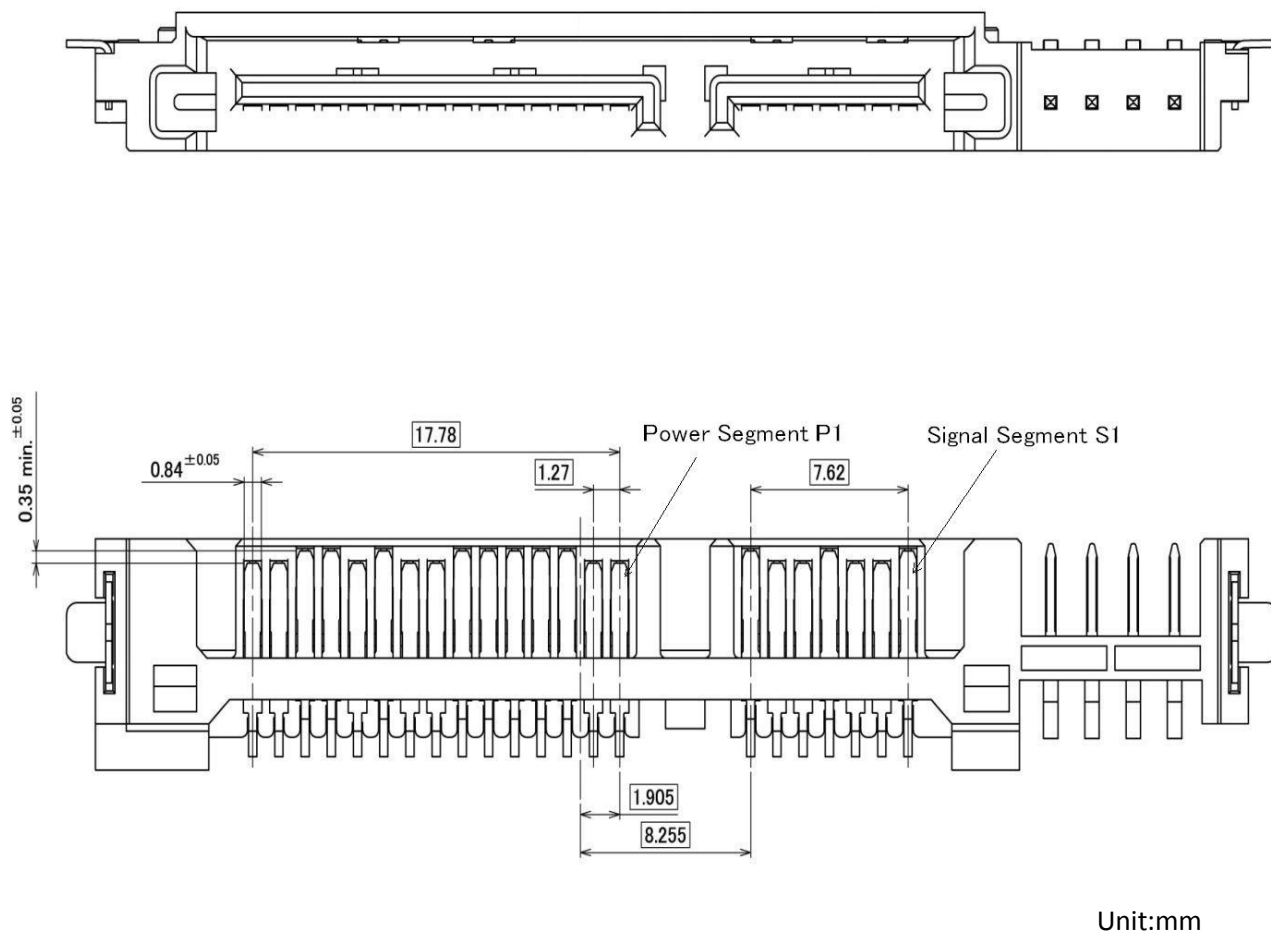
> **2.5 TYPE**

Unit:mm

Figure 4: 2.5-type Serial ATA Interface Connector Dimension

⤳ 2.5 TYPE DRIVE CONNECTER PIN ASSIGNMENT[1]

Segment	Pin Position	Name	Description
Signal Segment	S1	GND	2nd Mate
	S2	A+	Differential Signal Pair A (Device Rx), 3rd Mate
	S3	A-	
	S4	GND	2nd Mate
	S5	B-	Differential Signal Pair B (Device Tx), 3rd Mate
	S6	B+	
	S7	GND	2nd Mate
			Signal segment "L"
			Central connector polarizer
			Power segment "L"
Power Segment	P1	Retired[2]	
	P2	Retired[2]	
	P3	DEVSLP[2]	Enter/Exit DevSleep
	P4	GND	1st Mate
	P5	GND	2nd Mate
	P6	GND	2nd Mate
	P7	V5	5 V power, pre-charge[3], 2nd Mate
	P8	V5	5 V power, 3rd Mate
	P9	V5	5 V power, 3rd Mate
	P10	GND	2nd Mate
	P11	DAS/DSS	Drive Activity Signal / Disable Staggered Spin-up, 3rd Mate
	P12	GND	1st Mate
	P13	V12	12 V power, pre-charge, 2nd Mate (Unused)
	P14	V12	12 V power (Unused), 3rd Mate
	P15	V12	12 V power (Unused), 3rd Mate
			Power segment key

Note: 1) The Mate orders are for backplane usage. Hot-Plug and OS-Aware Hot Removal are supported when using with a backplane connector.

2) Previously, 3.3 V was assigned to pins P1, P2 and P3 by Serial ATA International Organization.

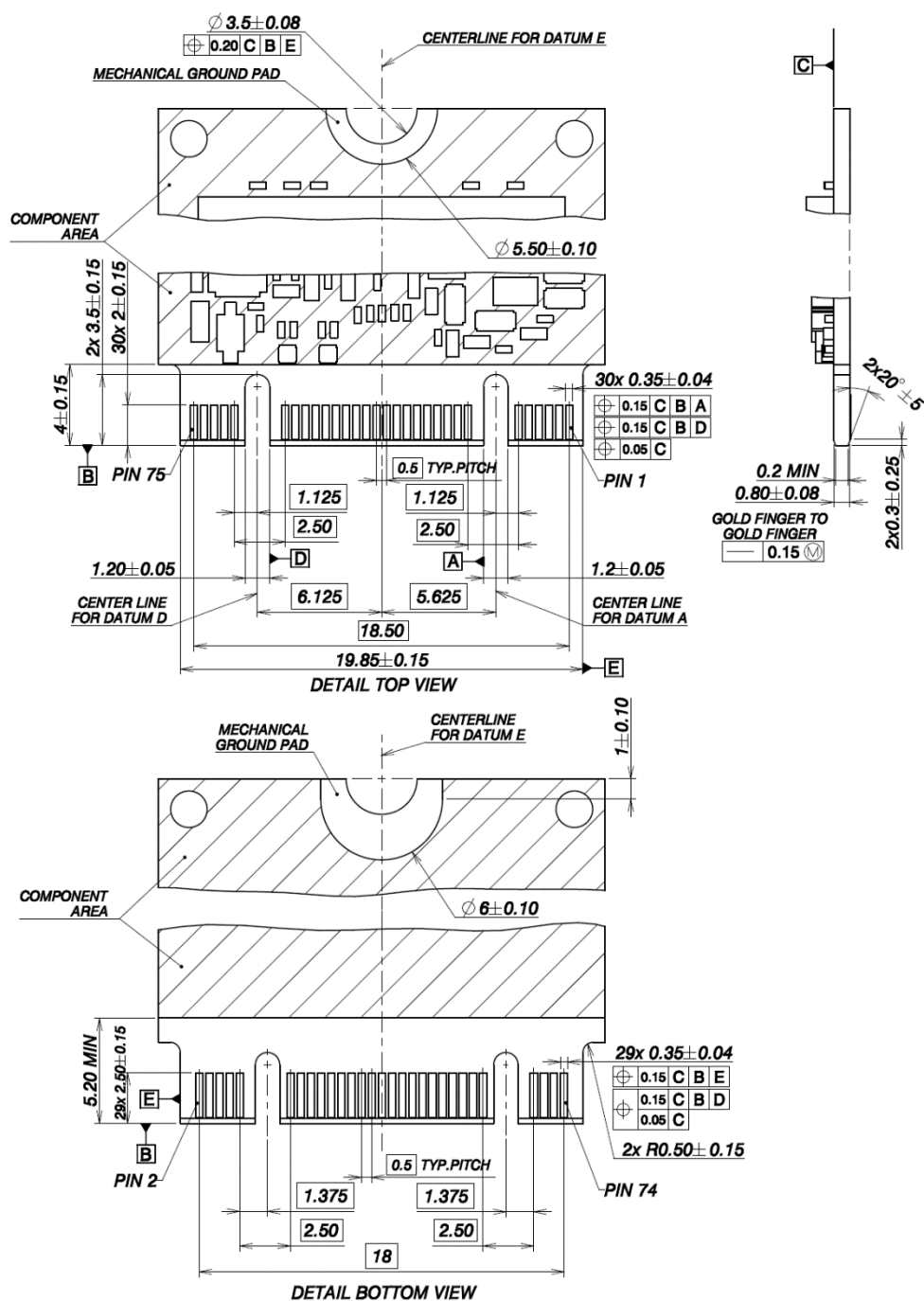3) Direct connect to non pre-charge pins.

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> **M.2 2280 MODULE**

Unit:mm

Figure 5: Interface Dimensions of KSG6xZMVxxxx (M.2 2280-S2 Module)

Unit:mm

Figure 6: Interface Dimensions of KSG6xZM81T02 (M.2 2280-D2 Module)

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M.2 2280 MODULE CONNECTOR PIN ASSIGNMENT

Pin #	Name	Description	Pin #	Name	Description
1	CONFIG_3	Defines module type(GND)	2	+3.3V	3.3 V Source
3	GND	GND	4	+3.3V	3.3 V Source
5	Reserved	NC	6	Reserved	NC
7	Reserved	NC	8	Reserved	NC
9	Reserved	NC	10	DAS/DSS	Drive Activity Signal / Disable Staggered Spin-up
11	Reserved	NC	Notch		
Notch			20	Reserved	NC
21	CONFIG_0	Defines module type(GND)	22	Reserved	NC
23	Reserved	NC	24	Reserved	NC
25	Reserved	NC	26	Reserved	NC
27	GND	GND	28	Reserved	NC
29	Reserved	NC	30	Reserved	NC
31	Reserved	NC	32	Reserved	NC
33	GND	GND	34	Reserved	NC
35	Reserved	NC	36	Reserved	NC
37	Reserved	NC	38	DEVSLP	DEVSLP signal
39	GND	GND	40	Reserved	NC
41	B+	Host Receiver Differential Signal Pair	42	Reserved	NC
43	B-		44	Reserved	NC
45	GND	GND	46	Reserved	NC
47	A-	Host Transmitter Differential Signal Pair	48	Reserved	NC
49	A+		50	Reserved	NC
51	GND	GND	52	Reserved	NC
53	Reserved	NC	54	Reserved	NC
55	Reserved	NC	56	MFG1	Manufacturing pin. Must be a no-connect on the host board.
57	GND	GND	58	MFG2	
Notch			Notch		
67	Reserved	NC	68	Reserved	NC
69	CONFIG_1	Defines module type(GND)	70	+3.3V	3.3 V Source
71	GND	GND	72	+3.3V	3.3 V Source
73	GND	GND	74	+3.3V	3.3 V Source
75	CONFIG_2	Defines module type(GND)			

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COMMAND TABLE

Op-Code		Command Name
00h		NOP
06h		DATA SET MANAGEMENT
10h		RECALIBRATE
20h		READ SECTOR(S)
21h		READ SECTOR(S) without retries
24h		READ SECTOR(S) EXT
25h		READ DMA EXT
27h		READ NATIVE MAX ADDRESS EXT
29h		READ MULTIPLE EXT
2Fh		READ LOG EXT
30h		WRITE SECTOR(S)
31h		WRITE SECTOR(S) without retries
34h		WRITE SECTOR(S) EXT
35h		WRITE DMA EXT
37h		SET MAX ADDRESS EXT
39h		WRITE MULTIPLE EXT
3Dh		WRITE DMA FUA EXT
3Fh		WRITE LOG EXT
40h		READ VERIFY SECTOR(S)
41h		READ VERIFY SECTOR(S) without retries
42h		READ VERIFY SECTOR(S) EXT
45h		WRITE UNCORRECTABLE EXT
45h	55h	Create a pseudo-uncorrectable error with logging
45h	AAh	Create a flagged error without logging
47h		READ LOG DMA EXT
57h		WRITE LOG DMA EXT
5Bh		TRUSTED NON-DATA
5Ch		TRUSTED RECEIVE
5Dh		TRUSTED RECEIVE DMA
5Eh		TRUSTED SEND
5Fh		TRUSTED SEND DMA
60h		READ FPDMA QUEUED
61h		WRITE FPDMA QUEUED
70h		SEEK
90h		EXECUTE DEVICE DIAGNOSTIC
91h		INITIALIZE DEVICE PARAMETERS

Op-Code		Feature Name
92h		DOWNLOAD MICROCODE
92h	03h	Download with offsets and save microcode for immediate and future use
92h	07h	Download and save microcode for immediate and future use
92h	0Eb	Download with offsets and save microcode for future use
92h	0Fb	Activate downloaded microcode
93h		DOWNLOAD MICROCODE DMA
93h	03h	Download with offsets and save microcode for immediate and future use
93h	07h	Download and save microcode for immediate and future use
93h	0Eb	Download with offsets and save microcode for future use
93h	0Fb	Activate downloaded microcode
B0h		SMART
B0h	D0h	SMART READ DATA
B0h	D1h	SMART READ ATTRIBUTE THRESHOLDS
B0h	D2h	SMART ENABLE/DISABLE ATTRIBUTE AUTOSAVE
B0h	D3h	SMART SAVE ATTRIBUTE VALUES
B0h	D4h	SMART EXECUTE OFF-LINE IMMEDIATE
B0h	D5h	SMART READ LOG
B0h	D6h	SMART WRITE LOG
B0h	D8h	SMART ENABLE OPERATIONS
B0h	D9h	SMART DISABLE OPERATIONS
B0h	DAh	SMART RETURN STATUS
B0h	DBh	SMART ENABLE/DISABLE AUTOMATIC OFF-LINE
B1h		DEVICE CONFIGURATION OVERLAY
B1h	C0h	DEVICE CONFIGURATION RESTORE
B1h	C1h	DEVICE CONFIGURATION FREEZE LOCK
B1h	C2h	DEVICE CONFIGURATION IDENTIFY
B1h	C3h	DEVICE CONFIGURATION SET
B1h	C4h	DEVICE CONFIGURATION IDENTIFY DMA
B1h	C5h	DEVICE CONFIGURATION SET DMA
B4h		SANITIZE DEVICE
B4h	00h	SANITIZE STATUS EXT
B4h	11h	CRYPTO SCRAMBLE EXT
B4h	12h	BLOCK ERASE EXT
B4h	20h	SANITIZE FREEZE LOCK EXT

Op-Code		Feature Name
C4h		READ MULTIPLE
C5h		WRITE MULTIPLE
C6h		SET MULTIPLE MODE
C8h		READ DMA
C9h		READ DMA without retries
CAh		WRITE DMA
CBh		WRITE DMA without retries
CEh		WRITE MULTIPLE FUA EXT
E0h		STANDBY IMMEDIATE
E1h		IDLE IMMEDIATE
E2h		STANDBY
E3h		IDLE
E4h		READ BUFFER
E5h		CHECK POWER MODE
E6h		SLEEP
E7h		FLUSH CACHE
E8h		WRITE BUFFER
E9h		READ BUFFER DMA
EAh		FLUSH CACHE EXT
EBh		WRITE BUFFER DMA
ECh		IDENTIFY DEVICE
EFh		SET FEATURES
EFh	02h	Enable volatile write cache
EFh	03h	Set transfer mode
EFh	05h	Enable the APM feature set
EFh	10h	Enable use of SATA feature set
EFh	55h	Disable read look-ahead
EFh	66h	Disable reverting to power-on defaults
EFh	82h	Disable volatile write cache
EFh	85h	Disable the APM feature set
EFh	90h	Disable use of SATA feature set
EFh	AAh	Enable read look-ahead
EFh	CCh	Enable reverting to power-on defaults

Op-Code		Feature Name
F1h		SECURITY SET PASSWORD
F2h		SECURITY UNLOCK
F3h		SECURITY ERASE PREPARE
F4h		SECURITY ERASE UNIT
F5h		SECURITY FREEZE LOCK
F6h		SECURITY DISABLE PASSWORD
F8h		READ NATIVE MAX ADDRESS
F9h		SET MAX ADDRESS
F9h	01h	SET MAX SET PASSWORD
F9h	02h	SET MAX LOCK
F9h	03h	SET MAX UNLOCK
F9h	04h	SET MAX FREEZE LOCK
F9h	05h	SET MAX SET PASSWORD DMA
F9h	06h	SET MAX UNLOCK DMA

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