TOSHIBA
Leading Innovation

HG6 SERIES

CLIENT SSD

SSD

The HG6 series of mainstream SATA Solid State Drives (SSDs) combine high performance with power efficiency to satisfy a wide range of applications from notebook PCs to servers in the datacenter.

As inventor of NAND flash memory technology, Toshiba leverages its NAND flash memory expertise to optimize the performance and data integrity, integrating proprietary technology such as the QSBC™ (Quadruple Swing-By Code) for improved error correction and reliability.

Customers truly have the power of choice with a broad selection of capacities up to 512 GB accelerating computer boot times and applications start times to provide an improved computing experience. They are available in standard form factors such as 2.5-type and M.2 2280.

KEY FEATURES

- Capacities up to 512GB
- Available in two Standard Form Factors of 2.5-type and M.2 2280
- MLC NAND Flash Memory
- Low Power Devsleep Feature Support
- End-to-End Data Protection
- QSBC™ (Quadruple Swing-By Code Technology) adapted

APPLICATIONS

- Notebook PCs
- Gaming PCs
- Read-Intensive Enterprise Applications
- Industrial Applications

Standard Models		2.5-type	M.2 2280-D2 (Double-Sided)
Memory		TOSHIBA MLC NAND Flash Memory	
Interface		SATA revision 3.1	
Maximum Speed		6 Gbit/s, 3 Gbit/s, 1.5 Gbit/s	
Connector Type		Standard SATA	M.2 B-M
Formatted Capacity[1)]		128/256/512GB	128/256/512GB
Command		ACS-2	
Performance [1),2)]	Sequential Read	up to 534 MB/s {510 MiB/s}	
	Sequential Write	up to 482 MB/s {460 MiB/s}	
Supply Voltage		5.0 V ±5 %	3.3 V ±5 %
Power Consumption		Active: 3.0 W typ. Idle: 125 mW typ.	Active: 3.0 W typ. Idle: 65 mW typ.
Temperature		Operating: 0 °C - 70 °C (case temperature) Non-operating: -40 °C - 85 °C	Operating: 0 °C - 80 °C (components temperature) Non-operating: -40 °C - 85 °C
Reliability[3)]		Mean Time to Failure (MTTF): 1,500,000 hours Product Life: Approximately 5 years	
Size		100.0 mm x 69.85 mm x 7.0 mm	80.0 mm x 22.0 mm x 3.58 mm
Weight		49 - 53 g typ.	7.0 – 7.6 g typ.
More Features		• Translation mode which enables any drive configuration • 28-bit LBA mode commands and 48-bit LBA mode commands supported • Automatic retries and corrections for read errors • NCQ (Native Command Queuing) function supported • Read only mode supported for emergency	
Compliance		UL, CSA, TÜV, MSIP, BSMI, CE, RCM	

Refer to the notes on the next page.

1) Definition of capacity: Toshiba 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) 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.

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.

ORDERING INFORMATION

THN	SN	J	XXXX	X	X	X
1	2	3	4	5	6	7

1.	Model Name	THN: Toshiba NAND drive
2.	Model Type	SN: Non-SED
3.	Controller Type	J: Type J
4.	Capacity	128G / 256G / 512G 128G is 128 GB, 256G is 256 GB and 512G is 512 GB (1 GB = 1,000,000,000 bytes)
5.	Form Factor	C: 2.5-inch (7.0 mm height) 8: M.2 2280 Module type (Double Side)
6.	Host I/F Type	S: Standard SATA, N: M.2 B-M SATA type
7.	NAND Type	Y: MLC

PRODUCT LINE UP

Model Number	Formatted Capacity	Interface	Function Note
THNSNJ128GCSY	128 GB	2.5-inch Specification Revision	Non-SED
THNSNJ256GCSY	256 GB		
THNSNJ512GCSY	512 GB		
THNSNJ128G8NY	128 GB	M.2 Type 2280-D2[1)]-B-M module	
THNSNK256G8NY	256 GB		
THNSNK512G8NY	512 GB		

1) Double Side

CAPACITY

Capacity	Total Number of User Addressable Sectors in LBA Mode
128 GB	250,069,680
256 GB	500,118,192
512 GB	1,000,215,216

Note: 1 GB (Gigabyte) = 1,000,000,000 bytes, Bytes per sector: 512 bytes

PERFORMANCE

	THNSNJ128GCSY THNSNJ128G8NY	THNSNJ256GCSY THNSNJ256G8NY	THNSNJ512GCSY THNSNJ512G8NY
Interface Speed	6 Gbit/s max.		
Sequential Read[1)]	up to 534 MB/s {510 MiB/s}		
Sequential Write[1)]	up to 450 MB/s {430 MiB/s}	up to 471 MB/s {450MiB/s}	up to 482 MB/s {460 MiB/s}

1) Under the condition of measurement with 128 KiB unit sequential access (1 KiB = 1024 bytes)

SUPPLY VOLTAGE

	2.5-inch	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: These drives have over current protection circuit. (Rated current: 3.15A)

POWER CONSUMPTION

Operation (Ta [1]=25°C)	2.5-inch		
	THNSNJ128GCSY	THNSNJ256GCSY	THNSNJ512GCSY
Read[2]	2.1 W typ.	2.5 W typ.	2.9 W typ.
Write[2]	2.2 W typ.	2.6 W typ.	3.0 W typ.
Idle[3] [4]	125 mW typ.	125 mW typ.	125 mW typ.
Standby[3] [4]	120 mW typ.	120 mW typ.	120 mW typ.
Sleep[3]	120 mW typ.	120 mW typ.	120 mW typ.
DevSleep	5 mW max	5 mW max	5 mW max

Operation (Ta [1]=25°C)	M.2 2280 Module		
	THNSNJ128G8NY	THNSNJ256G8NY	THNSNJ512G8NY
Read[2]	2.1 W typ.	2.5 W typ.	2.9 W typ.
Write[2]	2.2 W typ.	2.5 W typ.	3.0 W typ.
Idle[3] [4]	65 mW typ.	65 mW typ.	65 mW typ.
Standby[3] [4]	60 mW typ.	60 mW typ.	60 mW typ.
Sleep[3]	60 mW typ.	60 mW typ.	60 mW typ.
DevSleep	5 mW max	5 mW max	5 mW max

1) Ambient Temperature

2) The values are specified at the condition causing maximum power consumption.

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 NAND flash memory, while the drive is in idle or standby. Therefore, drive power consumption may temporally change up to write power.

ENVIRONMENTAL CONDITIONS

TEMPERATURE

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

1) Ta: Ambient Temperature, Tc: Case or Components Temperature
2) Packaged in Toshiba'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.

1) Packaged in Toshiba's original shipping package

SHOCK

Condition	Range
Operating	14.709 km/s^2 {1500 G}, 0.5 ms, half sine wave
Non-operating	
Under Shipment [1)]	100 cm free drop

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

VIBRATION

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

COMPLIANCE

SAFETY / EMI STANDARDS

Title	Description	Region
UL (Underwriters Laboratories)	UL 60950-1	USA
CSA (Canadian Standard Association) * Included UL logo mark	CSA-C22.2 No.60950-1	Canada
TÜV (Technischer Überwachungs Verein)	EN 60950-1	EURO
MSIP (Ministry of Science, ICT & Future Planning)	KN22, KN24	Korea
BSMI (Bureau of Standards, Metrology and Inspection)	CNS13438(CISPR Pub. 22)	Taiwan
CE	EN 55022, EN 55024	EURO
RCM	AS/NZS CISPR Pub. 22	Australia, New Zealand

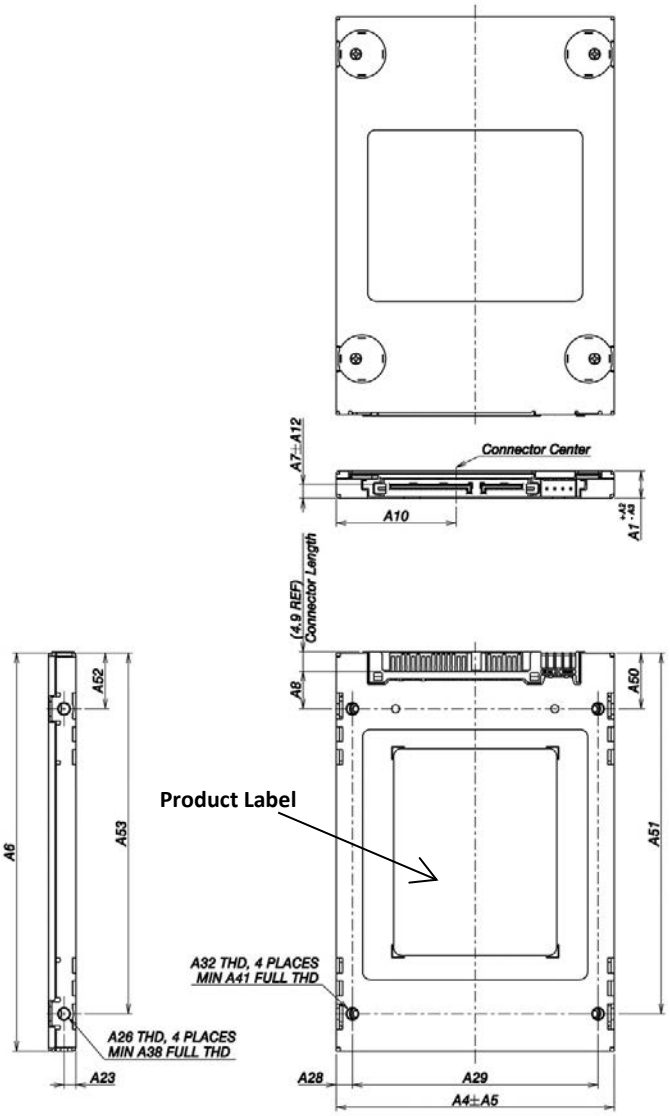
RELIABILITY

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

MECHANICAL SPECIFICATIONS

2.5-INCH

Model		Weight	Width	Height	Length
7.0 mm	THNSNJ128GCSY	49 g typ.	69.85 mm	7.0 mm	100.0 mm
	THNSNJ256GCSY	53 g typ.			
	THNSNJ512GCSY				



Unit:mm

Figure 1: 2.5-inch Drive Dimension

2.5-INCH DIMENSIONS

Dimension	SFF-8200 Rev2.0 [1] SFF-8201 Rev3.3 SFF-8223 Rev2.5		Toshiba SG5 SSD (Differences only)	
	Millimeters	Inches	Millimeters	Inches
A1	7.00	0.276		
A2	0.20	0.008		
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

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

M.2 2280 MODULE

Model	Weight	Width	Height	Length
THNSNJ128G8NY	7.0 g typ.	22.0 mm	3.58 mm	80.0 mm
THNSNJ256G8NY	7.1 g typ.			
THNSNJ512G8NY	7.6 g typ.			

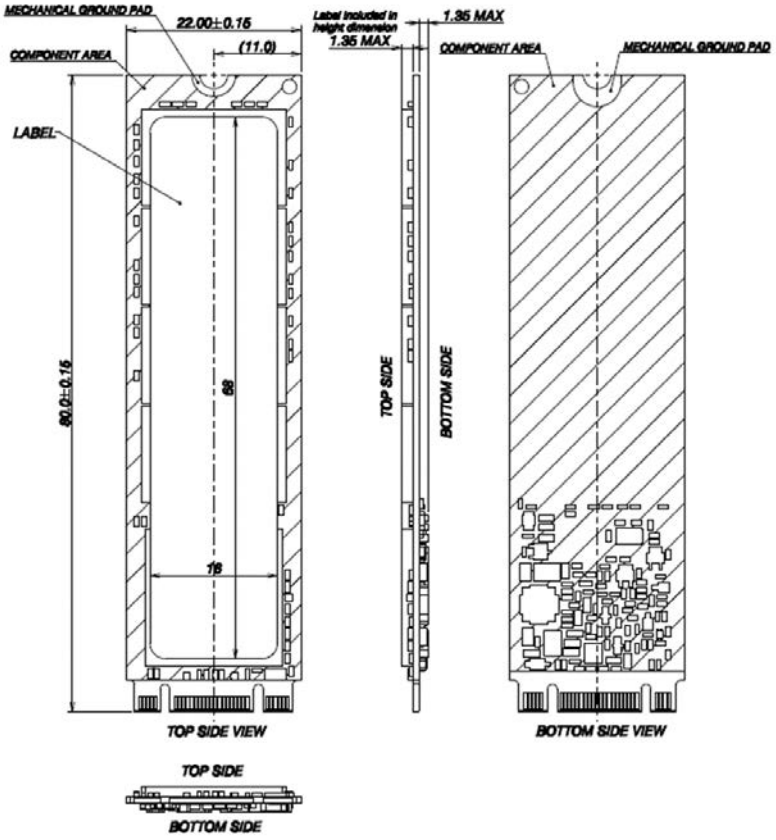


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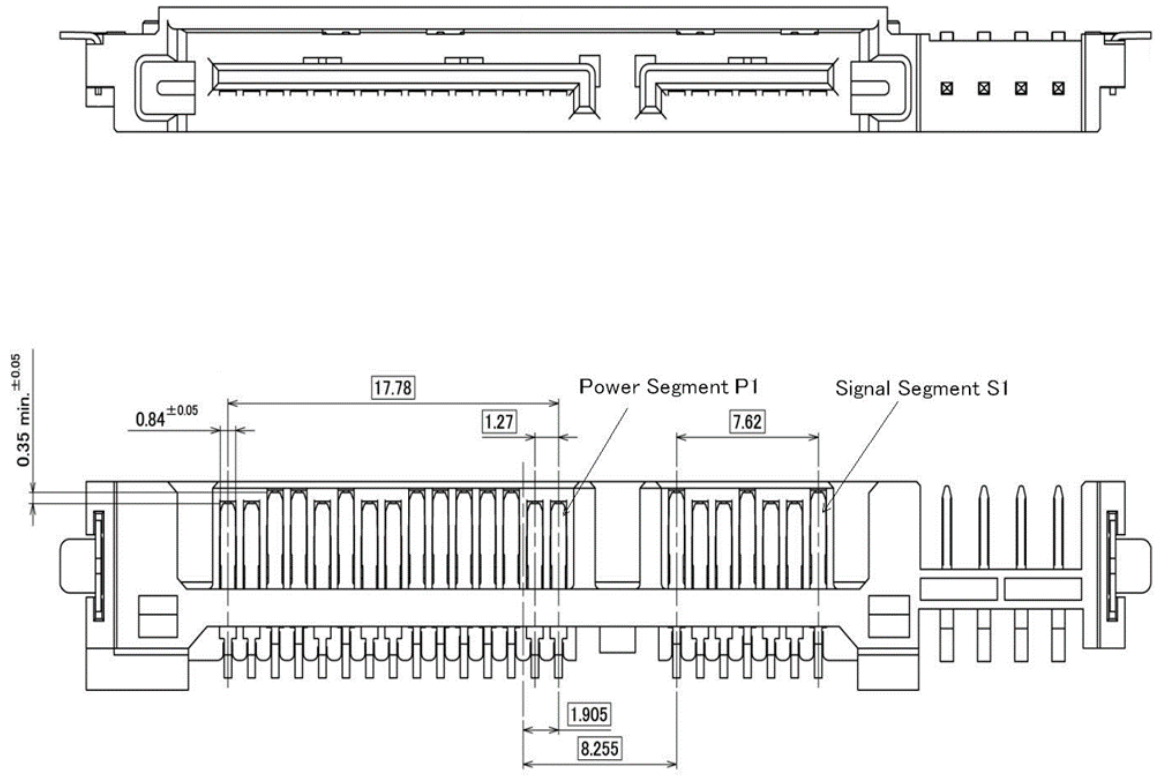
Figure 2: M.2 2280-D2 Module Dimension

INTERFACE CONNECTOR

2.5-inch Case Serial ATA Interface Connector



Unit:mm

Figure 3: 2.5-inch Case Serial ATA Interface Connector

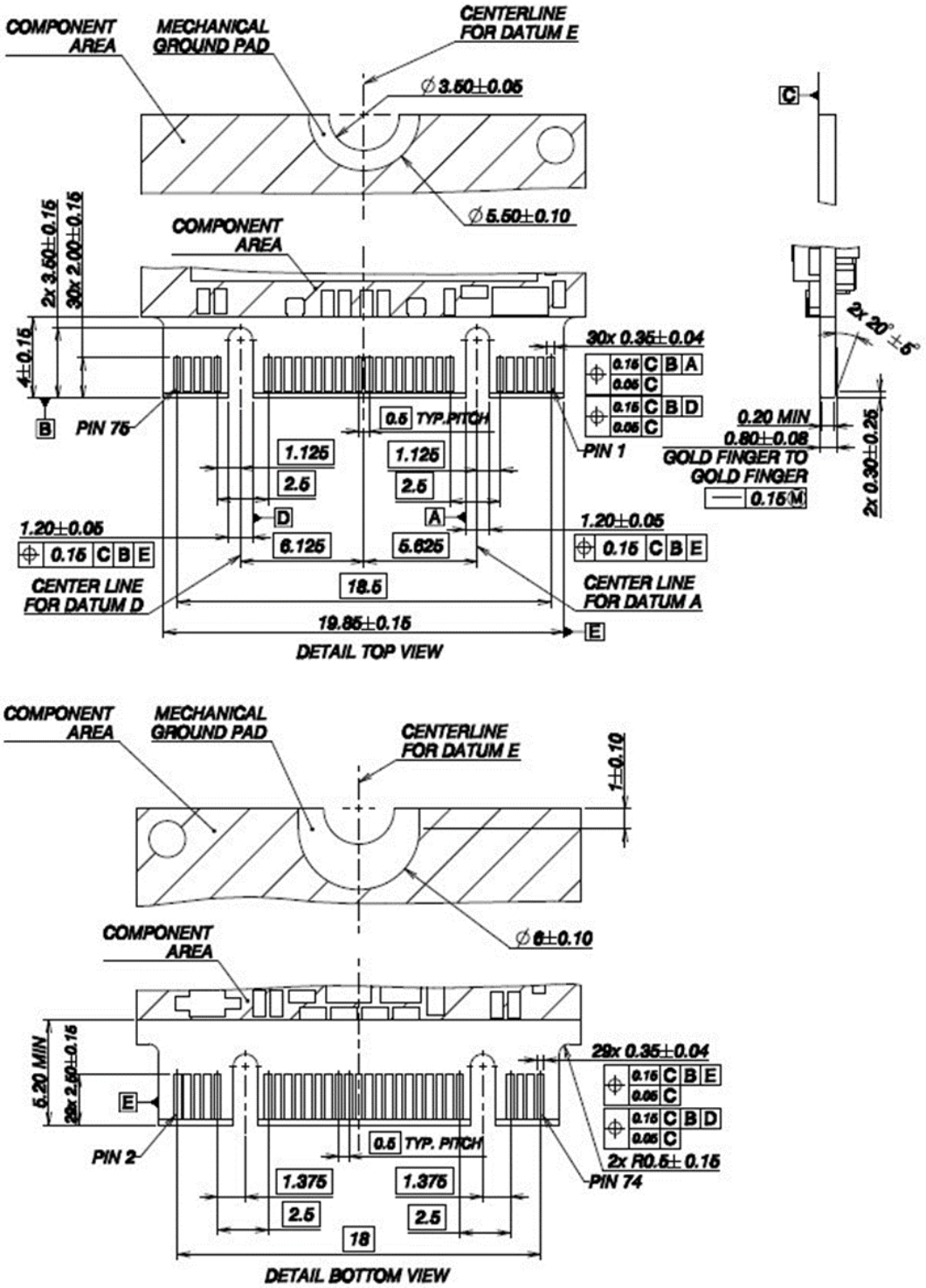
2.5-INCH DRIVE CONNECTER PIN ASSIGNMENT[1)]

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 [4)], 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			

U1	N.C.	Not connected
U2	TX	For test use, Not connected
U3	UX	For test use, Not connected
U4	GND	

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) DAS signal is option. DSS signal is not used for this drive.
4) Direct connect to non pre-charge pins.

M.2 2280 MODULE INTERFACE CONNECTOR



Unit:mm

Figure 4: M.2 2280 Module Interface Connector

PIN ASSIGNMENT ON M.2 2280 MODULE CONNECTOR

Pin #	Name	Description
1	CONFIG_3	Defines module type(GND)
3	GND	GND
5	Reserved	NC
7	Reserved	NC
9	Reserved	NC
11	Reserved	NC
Notch		
21	CONFIG_0	Defines module type(GND)
23	Reserved	NC
25	Reserved	NC
27	GND	GND
29	Reserved	NC
31	Reserved	NC
33	GND	GND
35	Reserved	NC
37	Reserved	NC
39	GND	GND
41	B+	Host Receiver Differential Signal Pair
43	B-	
45	GND	GND
47	A-	Host Transmitter Differential Signal Pair
49	A+	
51	GND	GND
53	Reserved	NC
55	Reserved	NC
57	GND	GND
Notch		
67	Reserved	NC
69	CONGIG_1	Defines module type(GND)
71	GND	GND
73	GND	GND
75	CONGIG_2	Defines module type(GND)

Pin #	Name	Description
2	+3.3V	3.3 V Source
4	+3.3V	3.3 V Source
6	Reserved	NC
8	Reserved	NC
10	DAS/DSS	Drive Activity Signal / Disable Staggered Spin-up
Notch		
20	Reserved	NC
22	Reserved	NC
24	Reserved	NC
26	Reserved	NC
28	Reserved	NC
30	Reserved	NC
32	Reserved	NC
34	Reserved	NC
36	Reserved	NC
38	DEVSLP	DEVSLP signal
40	Reserved	NC
42	Reserved	NC
44	Reserved	NC
46	Reserved	NC
48	Reserved	NC
50	Reserved	NC
52	Reserved	NC
54	Reserved	NC
56	MFG1	Manufacturing pin. Must be a no-connect on the host board.
58	MFG2	
Notch		
68	Reserved	NC
70	+3.3V	3.3 V Source
72	+3.3V	3.3 V Source
74	+3.3V	3.3 V Source

COMMAND TABLE

ADMIN Command set

Op-Code		Command Name
00h		NOP
06h		DATA SET MANAGEMENT
10h		RECALIBRATE
20h		READ SECTOR(S)
21h		READ SECTOR(S) without retry
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 retry
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 retry
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 MULTILE
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	10h	02h	Enable DMA Setup FIS Auto-Activate optimization
EFh	10h	03h	Enable Device-initiated interface power state (DIPM) transitions
EFh	10h	06h	Enable Software Settings Preservation(SSP)
EFh	10h	07h	Enable Device Automatic Partial to Slumber transitions
EFh	10h	09h	Enable Device Sleep

Op-Code			Feature Name
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	90h	02h	Disable DMA Setup FIS Auto-Activate optimization
EFh	90h	03h	Disable Device-initiated interface power state (DIPM) transitions
EFh	90h	06h	Disable Software Settings Preservation(SSP)
EFh	90h	07h	Disable Device Automatic Partial to Slumber transitions
EFh	90h	09h	Disable Device Sleep
EFh		AAh	Enable read look-ahead
EFh		CCh	Enable reverting to power-on defaults
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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