

# Solid State Drive HG3 Series

## Key Features

- High capacity in smallest size
- Fast access and fast transfer rate
- Low power consumption
- High reliability
- Intelligent Interface
- Data integrity

## Applications

- For General-purpose notebook PCs



## Specifications and Features

Form Factor	2.5-type Case	1.8-type Case	Micro SATA Module
Memory	TOSHIBA® 32nm MLC NAND Flash Memory		
Interface		ATA-8 ACS2, SATA revision 2.6 3Gb/s	
Capacity	64/128/256/512 GB	64/128/256 GB	64/128/256 GB
Performance	Maximum Data Read : 220 MB/s (Ave), Maximum Data Write : 180 MB/s (Ave)		
Supply Voltage	5.0V ±5%	3.3V ±5%	3.3V ±5%
Power Consumption	Active : 3.4W Typ. Idle : 53mW Typ.	Active : 2.9W Typ. Idle : 47mW Typ.	Active : 2.9W Typ. Idle : 47mW Typ.
Temperature	Operating : 0°C (Tc) – 70°C (Tc), Non-operating : -40°C – 85°C		
Shock		1500G @ 0.5 ms	
Vibration	Operating / Non-operating : 20G @ 10-2,000Hz		
Reliability	Mean Time to Failure (MTTF) : 1,000,000 hours Product Life : Approximately 5 years or 20,000 power on hours, whichever comes earlier		
Size	100.0mm x 69.85mm x 9.5mm	78.5mm x 54.0mm x 5.0mm	77.13mm x 48.65mm x 4.75mm
Weight	51-58g typ.	48g typ.	16g typ.
More Features	<ul style="list-style-type: none"> <li>• Translation mode which enables any drive configuration</li> <li>• 28-bit LBA mode commands and 48-bit LBA mode commands support</li> <li>• Multi word DMA</li> <li>• Ultra-DMA</li> <li>• Advanced PIO mode</li> <li>• Data Set Management Command set (Trim) support</li> <li>• Automatic retries and corrections for read errors</li> <li>• FDE (Full Disk Encryption) (Optional) <sup>*1</sup></li> </ul>		
Compliance	UL, CSA, TUV, KCC, FCC, BSMI, CE, C-Tick		

NOTE: \*1) The products with FDE option are subject to foreign exchange and foreign trade control laws.

## Ordering Information

<u>THN</u>	<u>SX</u>	<u>X</u>	<u>XXXG</u>	<u>X</u>	<u>X</u>	<u>X</u>
1	2	3	4	5	6	7

1. Model Name THN: Toshiba NAND drive
2. Model Type SN: Normal SSD, SF: FDE supported SSD (Optional)
3. Controller Type C: Type C
4. Capacity 064G / 128G / 256G / 512G / ...

064G is 64GB, 128G is 128GB, 256G is 256GB and 512G is 512GB  
(1 GB = 1,000,000,000 bytes)

5. Form Factor A: 1.8-type case, B: 2.5-type case (9.5mm height), M: Module type
6. Host I/F Type M: Micro SATA, S: Standard SATA
7. NAND Process J: 32nm MLC

## Product Line up

Product Number	Capacity	Form Factor
THNSxC064GBSJ	64 GB	2.5-type 9.5mm case
THNSxC128GBSJ	128 GB	
THNSxC256GBSJ	256 GB	
THNSxC512GBSJ	512 GB	
THNSxC064GAMJ	64 GB	1.8-type case
THNSxC128GAMJ	128 GB	
THNSxC256GAMJ	256 GB	
THNSxC064GMMJ	64 GB	Micro SATA module
THNSxC128GMMJ	128 GB	
THNSxC256GMMJ	256 GB	

NOTE: x: Refer to Chapter "Ordering Information"

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## 1. General Description

The TOSHIBA SSD HG series is a memory storage device using NAND Flash Memories, which has no mechanical moving parts and provides high performance and reliability.

The drive features an ATA-8 and Serial ATA revision 2.6 interface embedded controller that requires a simplified adapter board for interfacing to a Serial ATA or Serial ATA compatible bus. The drive is distinctive for its small and light body.

## 2. Product Specifications

### 2.1. Capacity

**Table 2-1. User Addressable Sectors in LBA Mode**

Formatted Capacity	Total Number of User Addressable Sectors in LBA Mode
64 GB	125,045,424
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

### 2.2. Performance

**Table 2-2. Host Transfer Rate and Data Transfer Rate in Read/Write**

Parameter	Transfer Rate
Host Transfer Rate	300 MB/s
Maximum Data Read <sup>*1</sup>	220 MB/s (Ave.)
Maximum Data Write <sup>*1</sup>	180 MB/s (Ave.)

NOTE: \*1) Under the condition of measurement with 128KB unit sequential access

### 3. Electrical Characteristics

#### 3.1. Supply Voltage

Table 3-1. Supply Voltage

	2.5-type Case	1.8-type Case	Micro SATA Module
Allowable voltage	5.0V ±5%	3.3V ±5%	
Allowable noise/ripple	100 mV p-p or less	100 mV p-p or less	
Allowable supply rise time	2 –100 ms	2 –100 ms	

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

#### 3.2. Power Consumption

Table 3-2. Power Consumption in 2.5-type Case Type

Operation (@25°C)	2.5-type Case			
	THNSxC064GBSJ	THNSxC128GBSJ	THNSxC256GBSJ	THNSxC512GBSJ
Read * <sup>1</sup>	1.2W Typ.	1.4W Typ.	1.7W Typ.	1.8W Typ.
Write * <sup>1</sup>	2.8W Typ.	3.0W Typ.	3.3W Typ.	3.4W Typ.
Idle * <sup>2</sup>	51mW Typ.	52mW Typ.	52mW Typ.	53mW Typ.
Standby * <sup>3</sup>	51mW Typ.	52mW Typ.	52mW Typ.	53mW Typ.
Sleep * <sup>3</sup>	50mW Typ.	52mW Typ.	52mW Typ.	53mW Typ.

Table 3-3. Power Consumption in 1.8-type Case Type and Micro SATA Module Type

Operation (@25°C)	1.8-type Case / Micro SATA Module		
	THNSxC064GAMJ	THNSxC128GAMJ	THNSxC256GAMJ
	THNSxC064GMMJ	THNSxC128GMMJ	THNSxC256GMMJ
Read * <sup>1</sup>	1.1W Typ.	1.3W Typ.	1.5W Typ.
Write * <sup>1</sup>	2.6W Typ.	2.7W Typ.	2.9W Typ.
Idle * <sup>2</sup>	47mW Typ.	47mW Typ.	47mW Typ.
Standby * <sup>3</sup>	47mW Typ.	47mW Typ.	47mW Typ.
Sleep * <sup>3</sup>	47mW Typ.	47mW Typ.	47mW Typ.

NOTE:

\*1) The read/write current is specified 220 MB/s in read, 180 MB/s in write.

\*2) The values are based on using S-ATA power management features. The Slumber mode is used for the idle mode power consumption measurements. In Idle mode, if a background write operation occurs, the drive power consumption may temporarily rise to that in write operation.

\*3) The values are based on using S-ATA power management features. The Slumber mode is used for Standby and Sleep modes power consumption measurements. In Standby mode, if a background write operation occurs, the drive power consumption may temporarily rise to that in write operation.

## 4. Environmental Conditions

### 4.1. Temperature and Humidity

**Table 4-1. Temperature**

Condition	Range	Gradient
Operating <sup>*1</sup>	0°C (Tc) – 70°C (Tc)	30°C (Ta) / h maximum
Non-operating	-40°C – 85°C	30°C / h maximum
Under Shipment <sup>*2</sup>	-40°C – 85°C	30°C / h maximum

NOTE: <sup>\*1</sup>) Ta: Ambient Temperature, Tc: Case Temperature

<sup>\*2</sup>) Packed in Toshiba's original shipping package

**Table 4-2. Humidity**

Condition	Range
Operating	8% – 90% R.H. (No condensation)
Non-operating	8% – 95% R.H. (No condensation)
Under Shipment <sup>*1</sup>	5% – 95% R.H.

NOTE: <sup>\*1</sup>) Packed in Toshiba's original shipping package

### 4.2. Shock and Vibration

**Table 4-3. Shock**

Condition	Range
Operating	1500G, 0.5 ms, half sine wave
Non-operating	1500G, 0.5 ms, half sine wave
Under Shipment <sup>*1</sup>	100 cm free drop

NOTE:

<sup>\*1</sup>) Apply shocks in each direction of the drive's three mutually perpendicular axes, one axis at a time.

Packed in Toshiba's original shipping package.

**Table 4-4. Vibration**

Condition	Range
Operating	20G Peak, 10-2,000Hz, (20min /Axis)x3 Axis
Non-operating	20G Peak, 10-2,000Hz, (12Cycle /Axis)x3 Axis, x20min.

## 5. Compliance

TOSHIBA SSDs HG series comply with the following.

**Table 5-1. Compliance**

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	Germany
KCC (Korea Communication Commission)	KN22 (CISPR Pub. 22), KN24 (CISPR Pub. 24)	Korea
FCC	FCC part 15 Subpart B Class B	USA
BSMI (Bureau of Standards, Metrology and Inspection)	CNS13438(CISPR Pub. 22)	Taiwan
CE Mark Declaration of Conformity	EN 55022, EN 55024	Europe
C-Tick	AS/NZS CISPR Pub. 22 Class B	Australia, New Zealand

## 6. Reliability

**Table 6-1. Reliability**

Parameter	Value
Mean Time to Failure	1,000,000 hours
Product Life	Approximately 5 years or 20,000 power on hours, whichever comes earlier

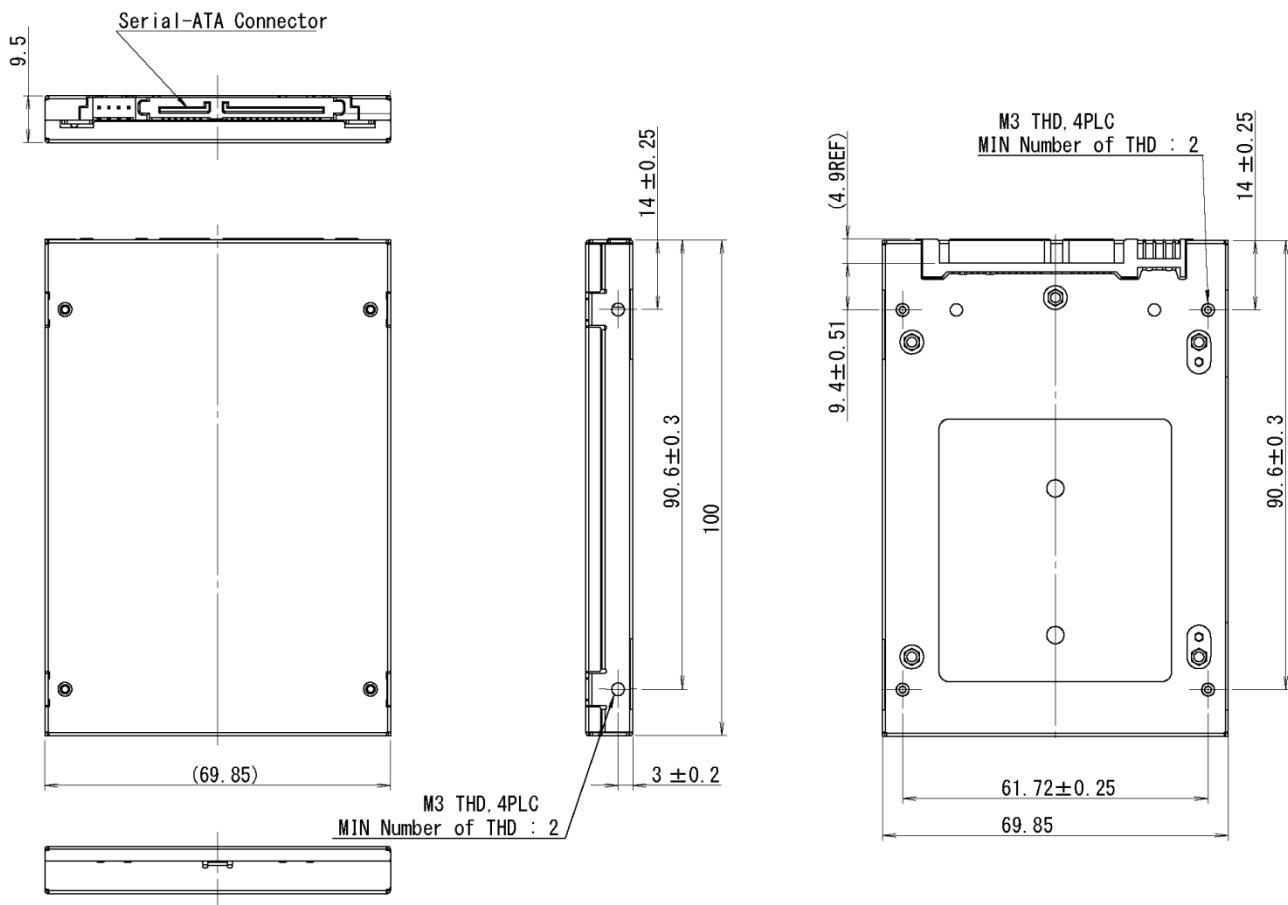
## 7. Mechanical Specifications

### 7.1. 2.5-type Case

Table 7-1. Weight and Dimensions

Model	Weight	Width	Height	Length
THNSxC064GBSJ	51 g Typ.	69.85 mm	9.5 mm	100.0 mm
THNSxC128GBSJ				
THNSxC256GBSJ				
THNSxC512GBSJ	58 g Typ.			

Figure 7-1. 2.5-type Case Drive Dimension

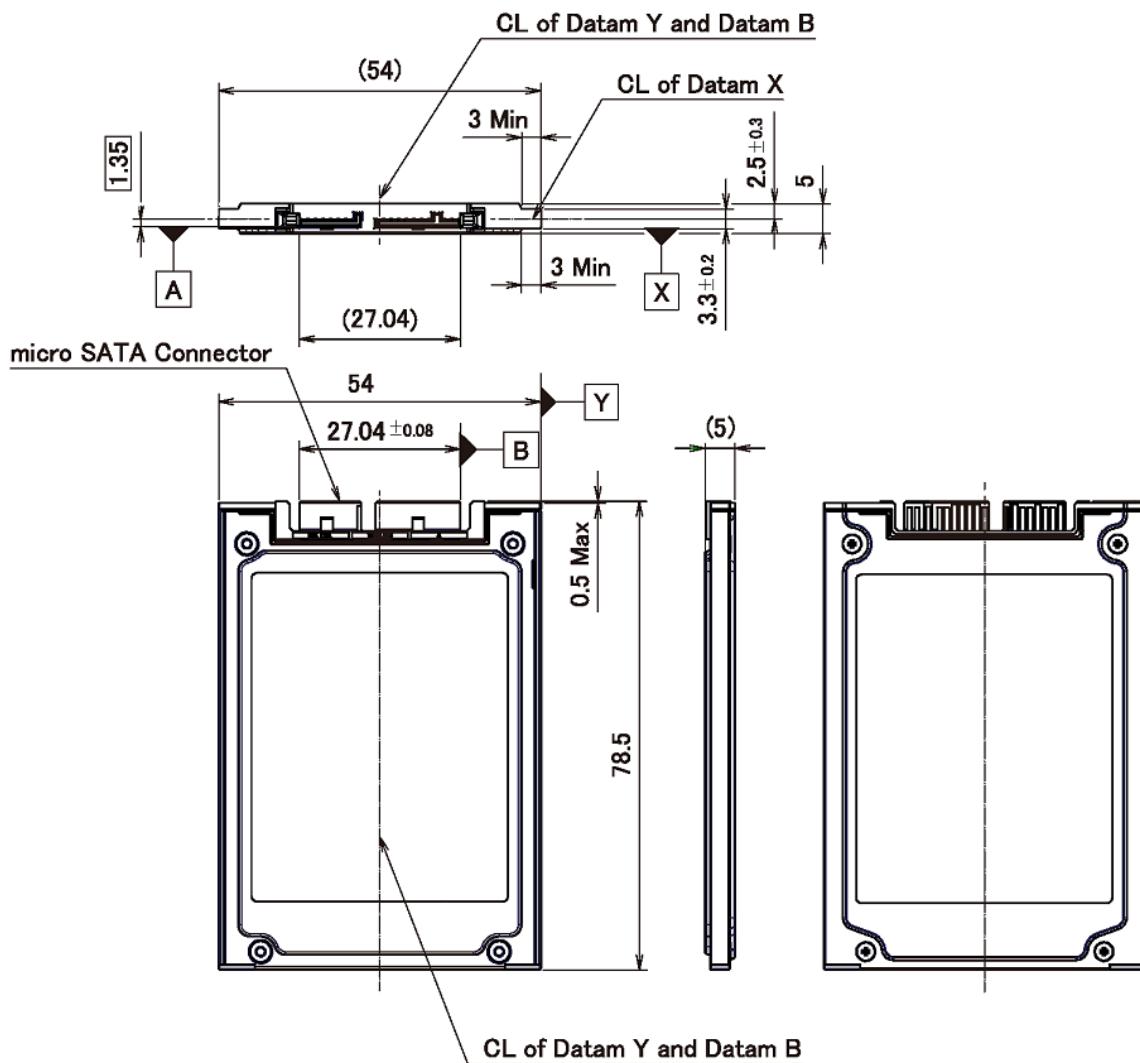


## 7.2. 1.8-type Case

**Table 7-2. Weight and Dimensions**

	<b>Weight</b>	<b>Width</b>	<b>Height</b>	<b>Length</b>
1.8-type Case	48 g Typ.	54.0 mm	5.0 mm	78.5 mm

**Figure 7-2. 1.8-type Case Drive Dimension**

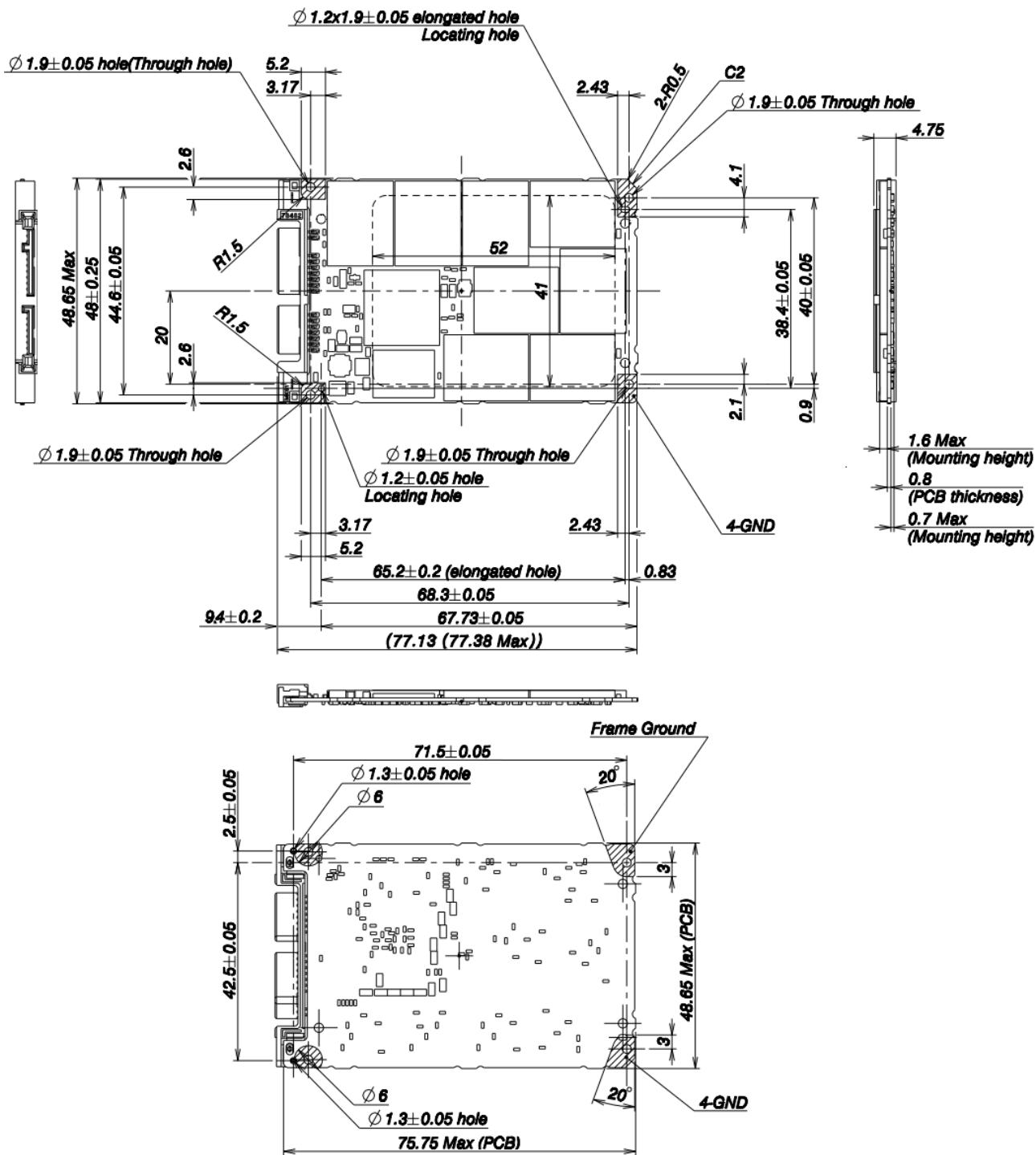


### 7.3. Micro SATA Module

Table 7-3. Weight and Dimensions

	Weight	Width	Height	Length
Micro SATA Module	16 g Typ.	48.65 mm	4.75 mm	77.13 mm

Figure 7-3. Micro SATA Module Drive Dimension



## 8. Interface Connector

### 8.1. 2.5-type Case

Figure 8-1. 2.5-type Case Serial ATA Interface Connector

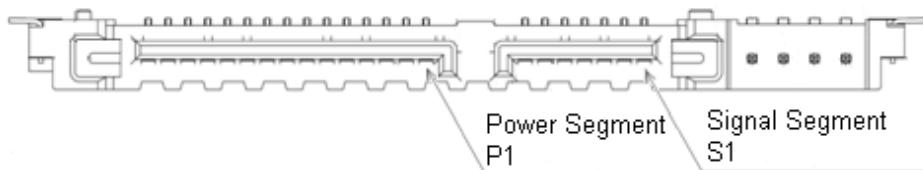
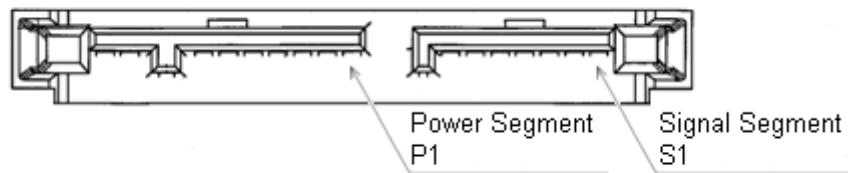


Table 8-1. 2.5-type Case Drive Connector Pin Assignment

Signal segment key			
Signal Segment	S1	GND	2 <sup>nd</sup> mate
	S2	A+	
	S3	A-	Differential Signal Pair A (Device Rx)
	S4	GND	
	S5	B-	
	S6	B+	Differential Signal Pair B (Device Tx)
	S7	GND	2 <sup>nd</sup> mate
Signal segment "L"			
Central connector polarizer			
Power segment "L"			
Power Segment	P1	V33	3.3V power (Unused)
	P2	V33	3.3V power (Unused)
	P3	V33	3.3V power pre-charge 2 <sup>nd</sup> mate (Unused)
	P4	GND	
	P5	GND	
	P6	GND	
	P7	V5	5V power pre-charge <sup>*2</sup> 2 <sup>nd</sup> mate
	P8	V5	5V power
	P9	V5	5V power
	P10	GND	
	P11	DAS/DSS <sup>*1</sup>	Reserved at ATA-8
	P12	GND	1 <sup>st</sup> mate
	P13	V12	12V power pre-charge 2 <sup>nd</sup> mate (Unused)
	P14	V12	12V power (Unused)
	P15	V12	12V power (Unused)
Power segment key			

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

Note: \*1) DAS/DSS signal is not used for this drive, \*2) Direct connect to non pre-charge pins

**8.2. 1.8-type Case and Micro SATA Module****Figure 8-2. Micro SATA Interface Connector****Table 8-2. Pin Assignment on Micro SATA Connector**

Signal segment key				
Signal Segment	S1	GND	2 <sup>nd</sup> mate	
	S2	A+	Differential Signal Pair A (Device Rx)	
	S3	A-		
	S4	GND		
	S5	B-	Differential Signal Pair B (Device Tx)	
	S6	B+		
	S7	GND	2 <sup>nd</sup> mate	
Signal segment "L"				
Central connector polarizer				
Power segment "L"				
Power Segment	P1	V33	3.3V power	
	P2	V33	3.3V power pre-charge *1 2 <sup>nd</sup> mate	
	P3	GND		
	P4	GND		
	P5	V5	5V power pre-charge 2 <sup>nd</sup> mate (Unused)	
	P6	V5	5V power (Unused)	
	P7	R	Reserved	
Key				
	P8	V	Vendor Specific	
	P9	V	Vendor Specific	
Power segment key				

Note: \*1) Direct connect to non pre-charge pins

## 9. Command Descriptions

Table 9-1. Supported ATA Command Set

Op-Code	Command Description	
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	
47h	READ LOG DMA EXT	
57h	WRITE LOG DMA EXT	
70h	SEEK	
90h	EXECUTE DEVICE DIAGNOSTIC	
91h	INITIALIZE DEVICE PARAMETERS	
92h	DOWNLOAD 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

Op-Code		Command Description	
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	
C4h		READ MULTILE	
C5h		WRITE MULTIPLE	
C6h		SET MULTIPLE MODE	
C8h		READ DMA	
C9h		READ DMA without retry	
CAh		WRITE DMA	
CBh		WRITE DMA without retry	
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	
EAh		FLUSH CACHE EXT	
ECh		IDENTIFY DEVICE	
EFh		SET FEATURES	
EFh	02h	Enable volatile write cache	
EFh	03h	Set transfer mode	
EFh	05h	Enable APM feature set	
EFh	10h	Enable Serial ATA feature set	
EFh	10h	02h	Enable DMA Auto-Active

Op-Code		Command Description	
EFh	10h	03h	Enable DIPM transitions
EFh	10h	06h	Enable SSP
EFh	55h		Disable read look-ahead
EFh	66h		Disable reverting to P-On default
EFh	82h		Disable volatile write cache
EFh	85h		Disable APM feature set
EFh	90h		Disable Serial ATA feature set
EFh	90h	02h	Disable DMA Auto-Activate
EFh	90h	03h	Disable DIPM
EFh	90h	06h	Disable SSP
EFh	AAh		Enable read look-ahead
EFh	CCh		Enable reverting to P-On default
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

## 10. Revision History

Rev.	Description	Date
1.0	Revised and enlarged edition of "Solid State Drives HG3 Series Product Brief Rev.01"	Sep. 02, 2011
1.1	Changed the title of this document Changed into "-type" from "inch" in name of form factor	Oct. 14, 2011

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