



Unity Digital
2.5" SATA Solid State Disk
Specification

USSSDXXXGBP

Datasheet Version 1.2

General Description

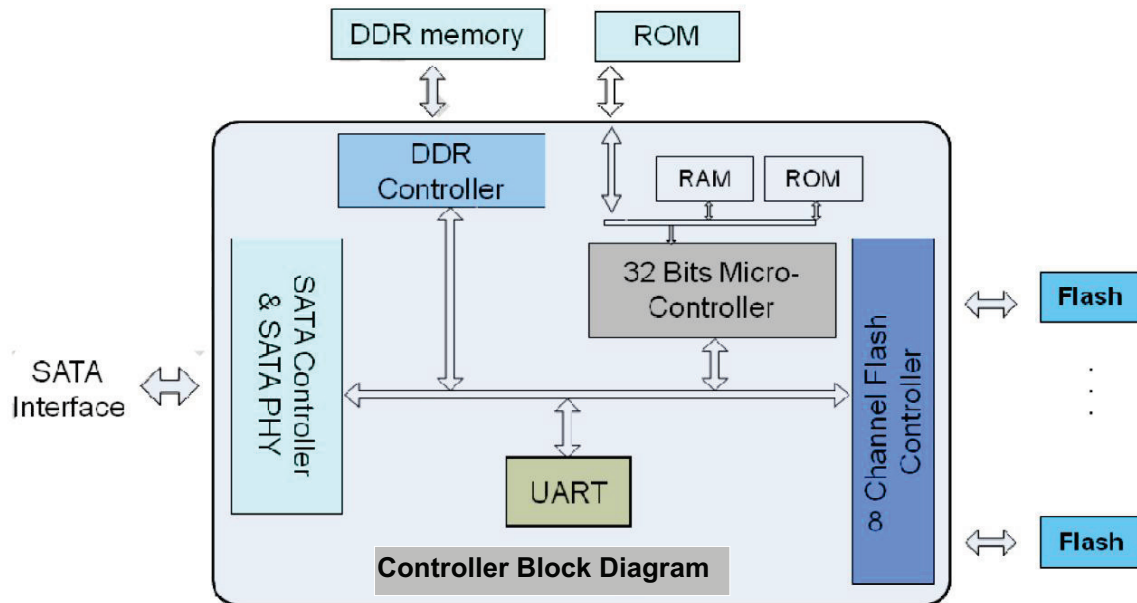
1.1 Overview

Unity Digital's 2.5" SATA Solid State Disk (SSD) delivers all the advantages of Flash Disk technology with Serial ATA II interface, fully compliant with standard 2.5-inch form factor.

The SATA SSD is based on a standard 7-pin interface for data segment and 15-pin for power segment, designed to operate at a maximum operating frequency of 150MHz with 30MHz external crystal. Its capacity could provide a wide range from 4GB to up to 512GB. Also it can reach more than 200MB/s read as well as write high performance based on MLC flash (with 128MB mobileDDR enabled and measured by CrystalDiskMark v3.0 1000MB test unit). The power consumption of Flash Disk is much lower than traditional Hard Drive. In addition, Unity Digital's SSD provides hot-swapping abilities when removing, replacing or upgrading flash disks.

1.2 Block Diagram

Flash Controller Block Diagram



1.3 Part Numbers and ordering information:

Part Number	Description	Operating Temp Range
USSSD004GBP	4GB SATA SSD	0°C ~ 70°C
USSSD008GBP	8GB SATA SSD	0°C ~ 70°C
USSSD016GBP	16GB SATA SSD	0°C ~ 70°C
USSSD032GBP	32GB SATA SSD	0°C ~ 70°C
USSSD064GBP	64GB SATA SSD	0°C ~ 70°C
USSSD128GBP	128GB SATA SSD	0°C ~ 70°C
USSSD256GBP	256GB SATA SSD	0°C ~ 70°C
USSSD512GBP	512GB SATA SSD	0°C ~ 70°C

Electrical/Physical interface

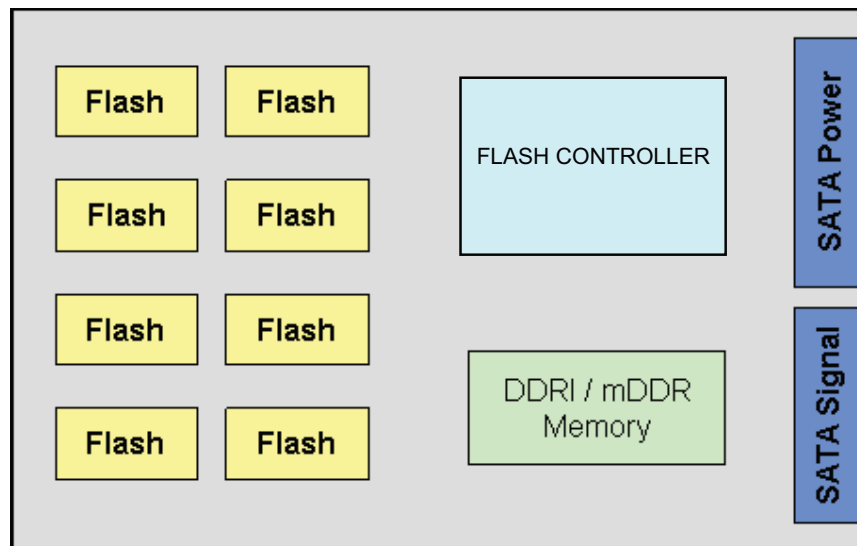
- a. SATA interface
 - Support SATA 1.5Gbps and 3Gbps interface
- b. DDR1 IO
 - Support DDR1 I/O interface
- c. Mobile-DDR IO
 - Support mobile-DDR I/O interface
- d. Flash IO
 - Support 1.8V and 3.3V voltage level
 - Support 1.8V for ONFI Flash
 - Support 3.3V for conventional Asynchronous Flash

Controller Features

- a. SATA II
 - SATA Revision 2.6 compliant.
 - Compatible with SATA 1.5Gbps and 3Gbps interface.
 - Power management supported
 - Support expanded register for SATA protocol 48 bits addressing mode
 - Embedded BIST function of SATA PHY for low cost mass production
- b. NAND Flash Interface
 - Build-in hardware ECC circuit (48bit/2KB)
 - Support all types of SLC and MLC NAND Flash
 - ONFI2.0 Interface support: 5 channels max, mode 2
 - Bus Width: 8/16 bit
 - Support 16 Flash chip enable
- c. Mobile-DDR interface
 - 32 bit data bus

- Data Rate: 320Mbps
 - Bandwidth: 1,280MB/s
 - Support Capacity: 128MB
- d. Build in 32 bits micro-controller
- e. UART
- f. Support of 10 GPIO pins
- g. Support TRIM command
- h. Support SMART command

SSD Block Diagram with DDR cache buffer



Product Specifications

2.1 Support Capacity

From 4GB up to 512GB (support 48bit addressing mode)

2.2 Performance

Its performance can reach more than 200MB/s for both sequential read and sequential write with DDR/mobileDDR cache buffer based on empty MLC flash (CrystalDiskMark v3.0 1000MB test unit). For detailed throughput on each density combination with different benchmarks (ATTO, IOMeter, CrystalDiskMark), please refer to Unity Digital's 2.5" SATA SSD Performance List (available upon request).

2.3 ECC scheme

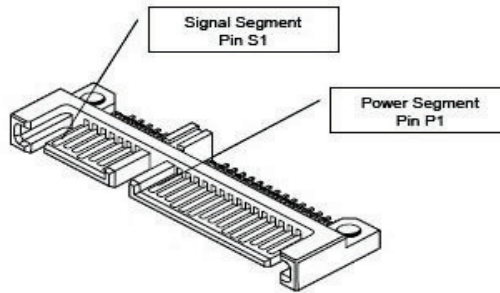
Support 48/32/28 bit ECC correct per 2K Byte data

2.4 Environmental Conditions

- ☆ Temperature: -40°C to 85°C in storage / 0°C to 70°C in operating
- ☆ Humidity: RH = 95% under 55°C
- ☆ Mechanical Spec: Shock 1500G/0.5ms / Vibration 20G/80-2000Hz
- ☆ Booting feature from Windows/Linux OS
- ☆ Acquired RoHS, WHQL, CE/FCC certificates
- ☆ Support Hot-Swapping technique
- ☆ Acoustic = 0dB

Electrical Specifications

3.1 Pin and Signal assignment



Signal Segment Pinout

Pin Number	Function	Description
S1	GND	2 nd mate
S2	A+	Differential signal pair A
S3	A-	
S4	GND	2 nd mate
S5	B-	Differential signal pair B
S6	B+	
S7	GND	2 nd mate

Power Segment Pinout

Pin Number	Function
P1	Not Used (3.3V)
P2	Not Used (3.3V)
P3	Not Used (3.3V Pre-Charge)
P4	GND
P5	GND
P6	GND
P7	5V Pre-Charge
P8	5V
P9	5V
P10	GND
P11	RESERVED
P12	GND
P13	Not Used (12V Pre-Charge)
P14	Not Used (12V)
P15	Not Used (12V)

3.2 Supply voltage

Parameter	Rating
OP. voltage	5V +/- 5%
Max. Ripple	100mV , 0~30MHz

3.3 Power Consumption

Parameter	Value
Standby	0.2W
Read Operating	1.4W ^{*1}
Write Operating	4.7W ^{*1}

***1: This data are measured by Fluke 287 multimeter and the capacity is 128GB with 16 flash.**

Command Description

1.1 ATA Command List

Description	Op Code	Description	Op Code
Check power mode	E5h	Security Disable Password	F6h
Data Set management	06h	Security Erase Prepare	F3h
DCO	B1H	Security Erase Unit	F4h
Download Microcode PIO	92h	Security Freeze Lock	F5h
Download Microcode DMA	93h	Security Set Password	F1h
Execute drive diagnostic	90h	Security Unlock	F2h
Flush cache	E7h	Seek	70h
Flush cache Ext	EAh	Set features	EFh
Identify device	ECh	Set Max Address	F9h
Idle	E3h	Set Max Address Ext	37h
Idle immediate	E1h	Set multiple mode	C6h
Initialize drive parameters	91h	Sleep	E6h
Read buffer	E4h	Smart	B0h
Read DMA (w/o retry)	C9h	Standby	E2h
Read DMA (w/retry)	C8h	Standby immediate	E0h
Read DMA Ext	25h	Write buffer	E8h
Read FPDMA QUEUED	60h	Write DMA (w/o retry)	CBh
Read Log Ext	2Fh	Write DMA (w/retry)	CAh
Read multiple	C4h	Write DMA Ext	35h
Read multiple Ext	29h	Write DMA FUA Ext	3Dh
Read native max address	F8h	Write FPDMA QUEUED	61h
Read native max Ext	27h	Write Log Ext	3Fh
Read sector(s) (w/o retry)	21h	Write multiple	C5h
Read sector(s) (w/retry)	20h	Write multiple Ext	39h
Read sector(s) Ext	24h	Write multiple FUA Ext	CEh
Read Verify Ext	42h	Write sector(s) (w/o retry)	31h
Read verify sector(s) (w/o retry)	41h	Write sector(s) (w/retry)	30h
Read verify sector(s) (w/retry)	40h	Write sector(s) Ext	34h
Recalibrate	10h	Write uncorrectable	45h

4.2 Identify Device Data

The following table detail the sector data returned by the IDENTIFY DEVICE command.

Word	F: Fixed V: Variable X: Both	Default Value	Description
0	F	0400h	General configuration bit-significant information
1	X	3FFFh	Obsolete – Number of logical cylinders (16383)
2	V	C837h	Specific configuration
3	X	0010h	Obsolete – Number of logical heads (16)
4-5	X	00000000h	Retired
6	X	003Fh	Obsolete – Number of logical sectors per logical track (63)
7-8	V	00000000h	Reserved for assignment by the Compact Flash Association
9	X	0000h	Retired
10-19	F	Varies	Serial number (20 ASCII characters)
20-21	X	0000h	Retired
22	X	0000h	Obsolete
23-26	F	Varies	Firmware revision (8 ASCII characters)
27-46	F	Varies	Model number (xxxxxxx)
47	F	8010h	7:0- Maximum number of sectors transferred per interrupt on MULTIPLE commands
48	F	0000h	Reserved
49	F	2F00h	Capabilities
50	F	4000h	Capabilities
51-52	X	000000000h	Obsolete
53	F	0007h	Words 88 and 70:64 valid
54	X	3FFFh	Obsolete – Number of logical cylinders (16383)
55	X	0010h	Obsolete – Number of logical heads (16)
56	X	003Fh	Obsolete – Number of logical sectors per track (63)
57-58	X	00FBFC10h	Obsolete – Current capacity in sectors –
59	F	0110h	Number of sectors transferred per interrupt on MULTIPLE commands
60-61	F	128GB - EE7C2B0h 64GB - 7740AB0h 32GB - 3BA2EB0h 16GB - 1DD40B0h	Total number of user addressable sectors



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62	X	0000h	Obsolete
63	F	0407h	Multi-word DMA modes supported/selected
64	F	0003h	PIO modes supported
65	F	0078h	Minimum Multiword DMA transfer cycle time per word
66	F	0078h	Manufacturer's recommended Multiword DMA transfer cycle time
67	F	0078h	Minimum PIO transfer cycle time without flow control
68	F	0078h	Minimum PIO transfer cycle time with IORDY flow control
69	F	0100h	Additional Supported (support download microcode DMA)
70	F	0000h	Reserved
71-74	F	0000000000000000h	Reserved for the IDENTIFY PACKET DEVICE command
75	F	001Fh	Queue depth
76	F	0706h	Serial SATA capabilities
77	F	0000h	Reserved for future Serial ATA definition
78	F	0044h	Serial ATA features supported
79	V	0040H	Serial ATA features enabled
80	F	01F8h	Major Version Number
81	F	0000h	Minor Version Number
82	F	346bh	Command set supported
83	F	70d9h	Command set supported
84	F	6023h	Command set/feature supported extension
85	V	3469h	Command set/feature enabled
86	V	bc01h	Command set/feature enabled
87	V	6023h	Command set/feature default
88	V	003Fh	Ultra DMA Modes
89	F	001Eh	Time required for security erase unit completion
90	F	001Eh	Time required for Enhanced security erase completion
91	V	0000h	Current advanced power management value
92	V	FFFEh	Master Password Revision Code
93	F	0000h	Hardware reset result. The contents of the bits (12:0) of this word shall change only during the execution of s hardware reset.
94	V	0000h	Vendor's recommended and actual acoustic management value
95	F	0000h	Stream Minimum Request Size
96	V	0000h	Streaming Transfer Time – DMA
97	V	0000h	Streaming Access Latency – DMA and PIO



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98-99	F	0000h	Streaming Performance Granularity
100-103	V	256GB - 1DCF32B0h 128GB - EE7C2B0h 64GB - 7740AB0h 32GB - 3BA2EB0h 16GB - 1DD40B0h	Maximum user LBA for 48 bit Address feature set
104	V	0000h	Streaming Transfer Time – PIO
105	F	0000h	Maximum number of 512-byte blocks per DATA SET MANAGEMENT command
106	F	4000h	Physical sector size / Logical sector size
107	F	0000h	Inter-seek delay for ISO-7779 acoustic testing in microseconds
108-111	F	0000000000000000h	Unique ID
112-115	F	0000000000000000h	Reserved
116	V	0000h	Reserved
117-118	F	00000000h	Words per logical Sector
119	F	4015h	Supported settings
120	F	4015h	Command set/Feature Enabled/Supported
121-126	F	0h	Reserved
127	F	0h	Removable Media Status Notification feature set support
128	V	0021h	Security status
129-159	X	0h	Vendor specific
160	F	0h	Compact Flash Association (CFA) power mode 1
161-167	X	0h	Reserved for assignment by the CFA
168	F	3h 2.5 inch 4h 1.8 inch 5h Less than 1.8 inch	Device Nominal Form Factor
169	F	0001h	DATA SET MANAGEMENT command is supported
170-173	F	0h	Additional Product Identifier
174-175		0h	Reserve
176-205	V	0h	Current media serial number
206	F	0h	SCT Command Transport(
207-208	F	0h	Reserved
209	F	4000h	Alignment of logical blocks within a physical block
210-211	V	0000h	Write-Read-Verify Sector Count Mode 3 (not support)
212-213	F	0000h	Write-Read-Verify Sector Count Mode 2 (not support)



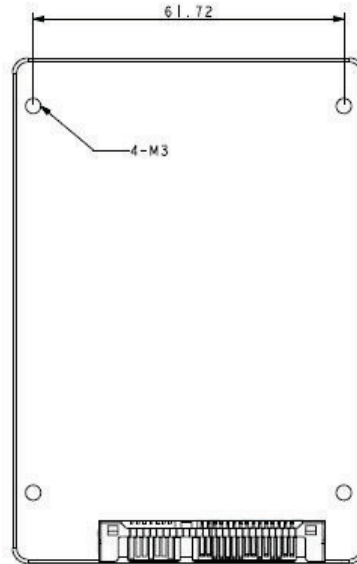
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214-216		0000h	NV Cache relate (not support)
217	F	0001h	Non-rotating media device
218	F	0h	Reserved
219	F	0h	NV Cache relate (not support)
220	V	0h	Write read verify feature set current mode
221		0h	Reserved
222	F	101Fh	Transport major version number
223	F	0h	Transport minor version number
224-229		0h	reserved
230-233		0h	Extend number of user addressable sectors
234		0001h	Minimum number of 512-byte data blocks per DOWNLOAD MICROCODE command for mode 03h
235		00FFh	Maximum number of 512-byte data blocks per DOWNLOAD MICROCODE command for mode 03h
236-254	F	0h	Reserved
255	X	XXA5h XX is variable	Integrity word (Checksum and Signature)

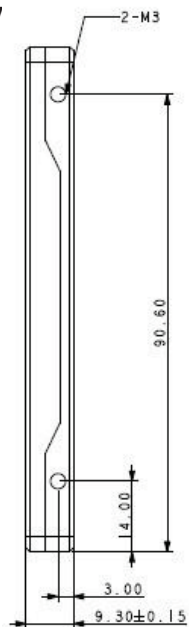
Physical Dimension

Dimension: 100.1mm(L) x 69.9mm(W) x 9.3mm(H)

Bottom View



Side V



Top View

