

2013

X5 2.5" SATAII SSD DATA SHEET



Renice Technology Co., Limited

2013-06-27

Revision History

Revision	Description	Date
1.0	Formal Release	06/27/2013
1.1	Adding Power Failure Protection Function	07/16/2013
1.2	Adding Security Function	08/02/2013

CATALOGUE

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1. Introduction

1.1 Product Overview

RENICE X5 2.5" SATA SSD are high-capacity flash memory-based Solid State Drive (SSD) that supports SATA II standard (3.0 Gb/sec) performance. With sustained read speed is up to 240 MB per second, and sustain write speed is up to 185MB per second, it substantially reduces the boot time of an operating system while consuming far less power than a hard disk drive (HDD). RENICE X5 2.5" SATA SSD are designed to withstand harsh environments. The SSD is vibration resistant and can work in lower or higher temperature than a standard HDD. RENICE X5 2.5" SATA SSD complies with ATA protocol, no additional drivers are required, it can be configured as a boot device or data storage device.

1.2 Feature

- **Standard Serial ATA 2.6:** SATA II, 3.0Gbps
- **Form factor:** 2.5 inch (100.0mmX70.0mmX9.0mm) LxWxH
- **Connector:** 7-pin signal segment and a 15-pin power segment
- **Performance:**
 - Max Sequential Data Read/Write: 240MB/150MB/s (MLC)
 - 240MB/185MB/s (SLC)
- **Capacities:** 8GB~512GB (MLC)
4GB~256GB (SLC)
- **Input voltage:** 5V (±5%)
- **Temperature ranges:**
 - Operation: 0~70°C (Standard) -40 to 85°C (Industrial)
 - Storage: -50 to 95°C
- **Intelligent features:**
 - Flash management algorithm: static and dynamic wear-leveling, bad block management algorithm
 - Supports dynamic power management and SMART (Self-Monitoring, Analysis and Reporting Technology)
 - Supports BCH ECC 72bits in 1024 bytes
 - Support Power Failure Protection
 - TRIM support
- **MTBF:** >3,000,000 Hours @25C

2. Functional Block Diagram

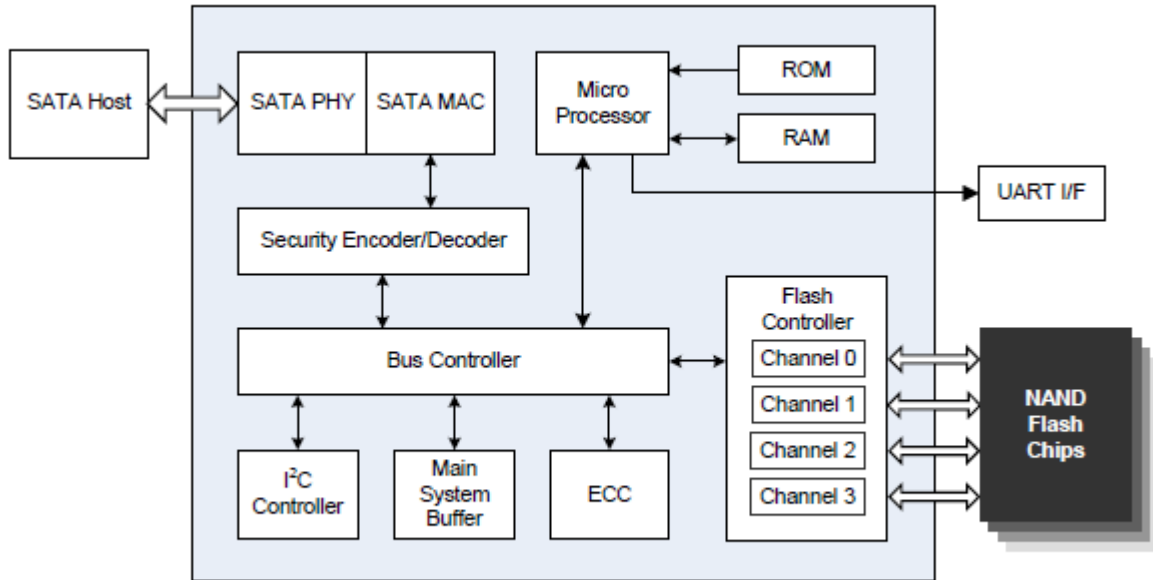


Figure 1: Renice X5 2.5" SATA SSD Block Diagram

3. Product Specifications

3.1 Physical Specifications

Table 1 Physical Specifications

Form Factor	2.5 INCH	
Dimensions	Length	100.0±0.25mm
	Width	70.0±0.25mm
	Height	9.0±0.25mm
Weight	<76g	
Connector	SATA II 7+15 pin	

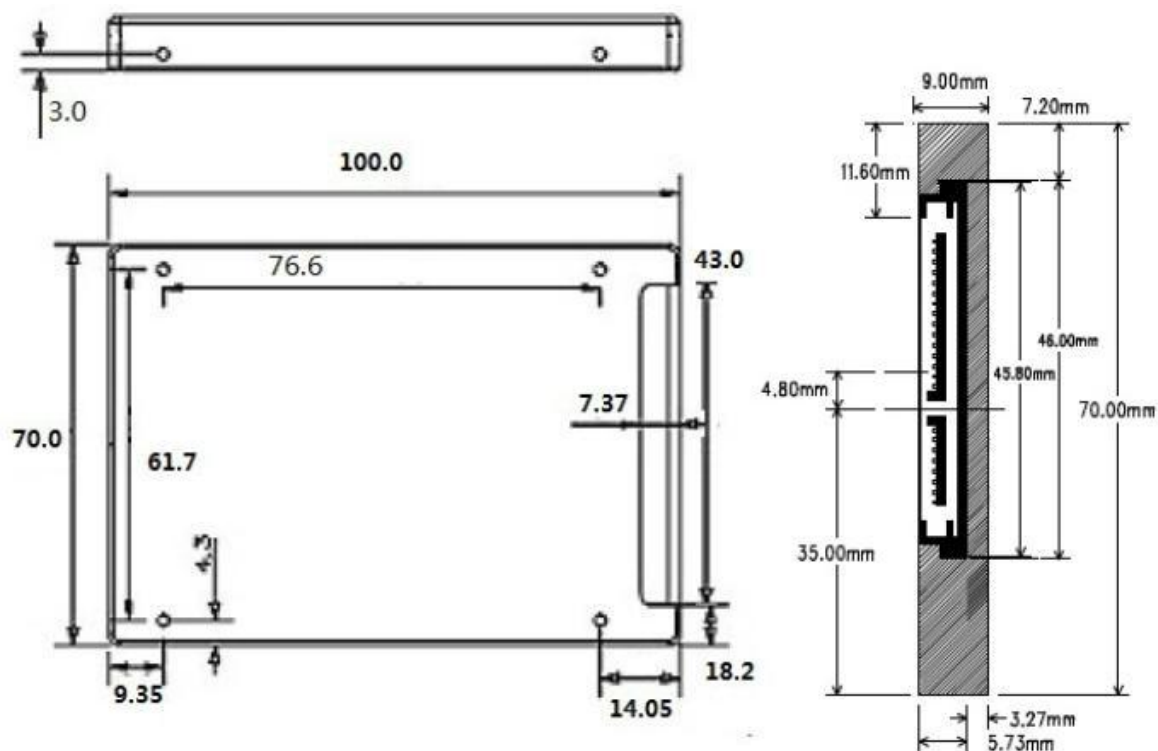


Figure 2: Renice X5 2.5" SATA SSD mechanical dimensions

3.2 Host Interface

Fully compliant with SATA revision 2.6, compatible with SATA 1.5Gb/s, 3.0Gb/s interface rates

Fully compliant with ATA-7 standard

PIO, DMA, UDMA (up to 6, dependent on host) supported

Native Command Queuing (NCQ): up to 32 commands

S.M.A.R.T. command transport (SCT) technology

4. Interface Description

4.1 Pin Assignment

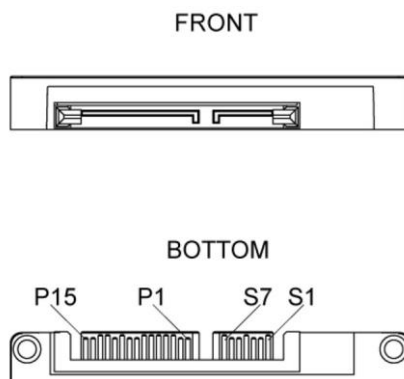


Figure 3: Pin Assignments

4.2 Pin Description

Table 3: Signal and Power segment

Pin No.	Pin Name	Pin No.	Pin Name
S1	GND	P1	CDI/DEVSLP(Optional)
S2	SATA Differential RX+ based on SSD	P2	CDI/DEVSLP(Unused)
S3	SATA Differential RX- based on SSD	P3	CDI/DEVSLP(Optional)
S4	GND	P4	GND
S5	SATA Differential TX- based on SSD	P5	GND
S6	SATA Differential TX+ based on SSD	P6	GND
S7	GND	P7	+5V
		P8	+5V
		P9	+5V
		P10	GND
		P11	DAS/DSS
		P12	GND
		P13	GPIO_Trigger
		P14	GPIO_LED
		P15	NC

5. Power Specifications

5.1 Operating Voltage

Operating voltage: 5V ($\pm 5\%$)

5.2 Power Supply Voltage

1.0V for Core, 3.3V for NAND and Core and Serial EEPROM

5.3 Power Consumption (typical)

Operation (Read/Write) – 1.02W/1.2W

Standby - 0.45W

Sleep (Partial/Slumber) - 0.5W/0.26W

6. Reliability Specification

6.1 Environment

Table 4: Environmental Specifications

Item	Features	
Temperature	Operation	Standard: 0~70°C
		Industrial: -40~+85°C
Humidity	5-95%	
Vibration	10Hz-2000Hz, 16.4 G (X, Y, Z axis, 1 hour /axis)	
Shock	Peak Acceleration: 1,500 G, 0.5ms(Half-sine wave, $\pm X, \pm Y, \pm Z$ axis, 1 time/axis)	
	Peak Acceleration: 50 G, 11ms(Half-sine wave, $\pm X, \pm Y, \pm Z$ axis, 3 times/axis)	

6.2 Wear-leveling

Renice X5 SSD support both static and dynamic wear-leveling, these two algorithms guarantee all type of flash memory at same level of erase cycles to improve lifetime limitation of NAND based storage.

6.3 H/W ECC and EDC for NAND Flash

BCH ECC 72 bits in 1024 bytes.

6.4 Power Failure Protection

Renice X5 2.5" SATA SSD adopts Voltage Detector Circuit to detect current voltage status, when current voltage is detected abnormal, the controller will block the NAND WP(write protect) pin to stop the data to be written into NAND, and ensure the existed data integrity upon sudden power loss.

6.5 Endurance

Write endurance: >25 years @ 100GB write/ day (512GB MLC)

Read endurance: unlimited

6.6 MTBF

MTBF (Mean Time between Failures) of Renice X5 SSD: >3,000,000 Hours @25C

7. Security Function

Renice X5 2.5" SATA SSD is designed with Secure Erase function for emergency data erasure. Secure Erase can be triggered by pressing the Secure Erase Key for 2 seconds. The process of erasure will not be stopped until finished when power failure happens, it will be continued when power is back on. There are 2 situations for the Secure Erase of Renice X5 SSD:

a. The SSD is acting as master drive:

In this case, the Secure Erase can not be triggered while read and write at the same time, but only triggered while just read or just write, or no read or write at that time. After finishing Secure Erase, the SSD gets to be uninitialized drive and can be used again after formatting.

b. The SSD is acting as slave drive:

In this case, the Secure Erase can only be triggered while no any data transmission (read or write) is happening. After finishing Secure Erase, the SSD gets to be uninitialized drive and can be used again after formatting.

8. Supported ATA Command Lists

Table 5: Support ATA Command Lists

Commands	Feature Set	ATA-8	Comments	OpCode
CHECK POWER MODE	Power Mgmt	M		E5h
DATA SET MANAGEMENT EXT (I.E.TRIM)	Data Set Mgmt	O		06h
DISABLE AUTOMATIC ACOUSTIC MGMT	Set Features			EFh
DISABLE DEVICE-INITIATED INTERFACE POWER-STATE TRANSITIONS	Set Features			EFh
DISABLE DMA SETUP FIS AUTO-ACTIVATE OPTIMIZATION	Set Features			EFh
DISABLE LOOK-AHEAD	Set Features			EFh
DISABLE REVERTING TO POWER-ON DEFAULTS	Set Features			EFh
DISABLE SOFTWARE SETTINGS PRESERVATION	Set Features			EFh
DISABLE WRITE CACHE	Set Features			EFh
DOWNLOAD MICROCODE	General	O		92h
ENABLE AUTOMATIC ACOUSTIC MGMT	Set Features			EFh
ENABLE DEVICE-INITIATED INTERFACE POWER-STATE TRANSITIONS	Set Features			EFh
ENABLE DMA SETUP FIS AUTO-ACTIVATE OPTIMIZATION	Set Features			EFh
ENABLE LOOK-AHEAD	Set Features			EFh
ENABLE REVERTING TO POWER-ON DEFAULTS	Set Features			EFh
ENABLE SOFTWARE SETTINGS PRESERVATION	Set Features			EFh
ENABLE WRITE CACHE	Set Features			EFh
EXECUTE DEVICE DIAGNOSTIC	General	M		90h
FLUSH CACHE	General	M		E7h

Commands	Feature Set	ATA-8	Comments	OpCode
FLUSH CACHE EXT	48-bit Address	M		EAh
IDENTIFY DEVICE	General	M		ECh
IDLE	Power Mgmt	M		E3h
IDLE IMMEDIATE	Power Mgmt	M	No support for unload	E1h
INITIATE DEVICE PARAMETERS	General	M		91h
NOP	General	O		00h
READ BUFFER	General	O		E4H
READ DMA	Data Transfer	M		C8h
READ DMA (w/o retry)	Data Transfer	Obs		C9h
READ DMA EXT	48-bit Address	M		25h
READ FPDMA QUEUED	Data Transfer NCQ	M		60h
READ LOG DMA EXT	Gen.Purpose Logging 48-bit	O		47h
READ LOG EXT	Gen.Purpose Logging	M		2Fh
READ LONG	Data Transfer			22h
READ LONG without Retry	Data Transfer			23h
READ MULTIPLE	Data Transfer	M		C4h
READ MULTIPLE EXT	48-bit Address	M		29h
READ NATIVE MAX ADDRESS	HPA	M		F8h
READ NATIVE MAX ADDRESS EXT	HPA	M		27h
READ SECTOR(S)	Data Transfer	M		20h
READ SECTOR(S) EXT	48-bit Address	M		24h
READ SECTOR(S) without Retry	Data Transfer			21h
READ VERIFY SECTOR(S)	General	M		40h
READ VERIFY SECTOR(S) EXT	48-bit Address	M		42h
READ VERIFY SECTOR(S) (w/o retry)	General	Obs		41h
RECALIBRATE	General	Obs		10h
SCT COMMAND/STATUS	SMART			B0h
SCT DATA YABLES:READ TABLE:(HDA) TEMPERATURE HISTORY TABLE	SMART			B0h

Commands	Feature Set	ATA-8	Comments	OpCode
SCT DATA TRANSFER	SMART			B0h
SCT FEATURE CONTROL: FORCED WRITE CACHE ENABLE & DIABLE	SMART			B0h
SCT WRITE SAME	SMART		Not recommended for SSDs:can negatively affect initial performance of drive.	B0h
SECURITY DIABLE PASSWORD	Security	M		F6h
SECURITY ERASE PREPARE	Security	M		F3h
SECURITY ERASE UNIT	Security	M		F4h
SECURITY FREEZE LOCK	Security	O		F5h
SECURITY SET PASSWORD	Security	M		F1h
SECURITY UNLOCK	Security	M		F2h
SEEK	General	M		70h
SET MAX ADDRESS	HPA	M		F9h
SET MAX ADDRESS EXT	HPA	M		37h
SET MAX FREEZE LOCK	HPA	O		F9h/04h
SET MAX LOCK	HPA	O		F9h/02h
SET MAX SET PASSWORD	HPA	O		F9h/01h
SET MAX UNLOCK	HPA	O		F9h/03h
SET MULTIPLE MODE	General	M		C6h
SET TRANSFER MODE(based on value in SECTOR COUNT REGISTER	Set Features			EFh
SLEEP	Power Mgmt	M		E6h
SMART ABORT OFFLINE ROUTINE	SMART			E0h
SMART DISABLE OPERATIONS	SMART	M		B0h/D9h
SMART ENABLE OPERATIONS	SMART	M		B0h/D8h
SMART ENABLE/DISABLE AUTOSAVE	SMART	M		B0h/D2h
SMART EXECUTE CONVEYANCE SELF-TEST ROUTINE (captive)	SMART			B0h

Commands	Feature Set	ATA-8	Comments	OpCode
SMART EXECURE CONVERYANCE SELF-TEST ROUTINE (offline)	SMART			B0h
SMART EXECUTE EXTENDED SELF-TEST ROUTINE	SMART			B0h
SMART EXECUTE EXTENDED SELF-TEST ROUTINE (captive)	SMART			B0h
SMART EXECUTE OFFLINE IMMEDIATE	SMART	O		B0h/D4h
SMART EXECUTE OFFLINE ROUTINE	SMART			B0h
SMART EXECUTE SELECTIVE SELF-TEST ROUTINE	SMART			B0h
SMART EXECUTE SELECTIVE SELF-TEST ROUTINE(captive)	SMART			B0h
SMART EXECUTE SHORT SELF-TEST ROUTINE	SMART			B0h
SMART EXECUTE SHORT SELF-TEST ROUTINE(captive)	SMART			B0h
SMART READ DATA	SMART	O		B0h/D0h
SMART READ LOG	SMART	O		B0h/D5h
SMART READ THRESHOLD	SMART	Obs		B0h-D1 h
SMART RETURN STATUS	SMART	O		B0h/DA h
SMART SAVE ATB THRESHODS	SMART	Obs		B0h-D3 h
SMART WRITE LOG	SMART	O		B0h/D6h
STANDBY	Power Mgmt	M		E2h
STANDBY IMMEDIATE	Power Mgmt	M		E0h
WRITE BUFFER	General	O		E8h
WRITE DMA	Data Transfer	M		CAh
WRITE DMA (w/0 retry)	Data Transfer	Obs		CBh
WRITE DMA EXT	48-bit Address	M		35h
WRITE DMA FUA EXT	48-bit Address	M		3Dh
WRITE FPDMA QUEUED	Data Transfer NCQ	M		61h

Commands	Feature Set	ATA-8	Comments	OpCode
WRITE LOG DMA EXT	Gen.Purpose Logging	O		57h
WRITE LOG EXT	Gen.Purpose Logging	M		3Fh
WRITE LONG	Data Transfer			32h
WRITE LONG without Retry	Data Transfer			33h
WRITE MULTIPLE	Data Transfer	M		C5h
WRITE MULTIPLE EXT	48-bit Address	M		39h
WRITE MULTIPLE FUA EXT	48-bit Address	M		CEh
WRITE SECTOR(S)	Data Transfer	M		30h
WRITE SECTOR(S) (w/o retry)	Data Transfer	Obs		31h
WRITE SECTOR(S) EXT	48-bit Address	M		34h
WRITE UNCORRECTABLE EXT	General	O		45h
Key: M-Mandatory O-Optional P-Prohibited N-Not defined				

9. SMART

9.1 SMART Command Set

Table 6: SMART Command Set

Value(Hex)	Command
00-CF	Reserved
D0	SMART read attributes
D1 *	SMART read threshold
D2	SMART enable/disable attribute auto save
D3 *	SMART save attribute values
D4	SMART execute off-line immediate
D5	SMART read log sector
D6	SMART write log sector
D7 *	SMART write attribute threshold
D8	SMART enable operations
D9	SMART disable operations
DA	SMART return status
DC-FF	Reserved(Vendor Specific)

9.2 SMART Attribute Data Structure

Table 7: SMART Attribute Data Structure

Byte	Description
0:1	SMART structure version number
2	First Stored Attribute Number (i.e."1" for "Raw Read Error Rate")
3:4	Status
5	Nominal value
6	Worst value since SSD was deployed
7:12	Raw Data
13	(Reserved; for some Attributes, the 7th "raw data" byte)
14:25	Next Stored Attribute Number(i.e."3" for "Retired Block Count")
26:361	Next Stored Attribute Nos(max 30 collected Attributes, including above)
362	Off-line data collection status
363	Self-Test execution status byte
364:365	Total time to complete off-line data collection(in seconds)
366	(Reserved)
367	Off-line data collection capability
368:369	SMART capability
370	Error Logging Capability(bit 0 set=device error logging supported)
371	Next Self Test Step
372	Short Self Test routine recommended polling time(in minutes)
373	Extended Self Test routine recommended polling time(in minutes)
374	Recommended polling time for conveyance Self Test
375:376	Time for Extended Self Test if > 255(ie, 373 to FFh)
377:385	(Reserved)
386:510	Vendor information
511	Checksum if data structure (generated on retrieval of stored data)

10. Ordering Information

Table 8: Valid Combinations

Capacities/Flash type	Standard Temp	Industrial Temp
8GB/MLC	RCM008-SX52	RIM008-SX52
16GB/MLC	RCM016-SX52	RIM016-SX52
32GB/MLC	RCM032-SX52	RIM032-SX52
64GB/MLC	RCM064-SX52	RIM064-SX52
128GB/MLC	RCM128-SX52	RIM128-SX52
256GB/MLC	RCM256-SX52	RIM256-SX52
512GB/MLC	RCM512-SX52	RIM512-SX52
4GB/SLC	RCS004-SX52	RIS004-SX52
8GB/SLC	RCS008-SX52	RIS008-SX52
16GB/SLC	RCS016-SX52	RIS016-SX52
32GB/SLC	RCS032-SX52	RIS032-SX52
64GB/SLC	RCS064-SX52	RIS064-SX52
128GB/SLC	RCS128-SX52	RIS128-SX52
256GB/SLC	RCS256-SX52	RIS256-SX52

11. Part Number Naming Rule

