

2011

RENICE X2 2.5" SATA SSD(Rev.1.4) DATA SHEET



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Revision History

Revision	Description	Date
1.0	Formal Release	03/16/2009
1.1	Updated Ordering Information and Product Naming Rules	05/05/2009
1.2	Updated Ordering Information and Product Naming Rules	04/10/2011
1.3	Adding Higher Capacity-256GB	09/17/2011
1.4	Updated MTBF	12/25/2011

CATALOGUE

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1. Introduction

1.1 Product Overview

RENICE X2 2.5" SATA SSD are high-capacity flash memory-based Solid State Drive (SSD) that electrically comply with Serial ATA (SATA) standard. RENICE X2 2.5" SATA SSD supports SATA II standard (3.0 Gb/sec) performance. Sustained read speed is up to 250 MB per second, and sustain write speed is up to 200 MB per second. RENICE X2 2.5" SATA SSD is designed on the 2.5-inch form factor with SATA interface. RENICE X2 2.5" SATA SSD is designed for industrial field. It substantially reduces the boot time of an operating system while consuming far less power than a hard disk drive (HDD). RENICE X2 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 X2 2.5" SATA SSD complies with ATA protocol, no additional drivers are required, and the SSD can be configured as a boot device or data storage device.

1.2 Feature

- **Standard Serial ATA 2.6:** SATA II, 3.0 Gbps
- **Form factor:** 2.5 inch (100.2mmX69.5mmX9.6mm) LxWxH
- **Connector:** 7-pin signal segment and a 15-pin power segment
- **Performance:**
 - Burst Rate: 300MB/S
 - Sequential Data Read/Write: 250/200MB/s
 - 4kb Random Read/Write IOPS: up to 8,000/6,000
 - Access Time: 0.1ms
- **Capacities:** 8GB, 16GB, 32GB, 64GB, 128GB, 256GB
- **Nand flash type:** SLC or MLC NAND flash
- **Input voltage:** 5.0V (±5%)
- **Temperature ranges:**
 - Operation:
 - Industrial: -40 to 85°C (-40° ~ 185°F)
 - Storage: -50 to 95°C (-50° ~ 203°F)
- **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)
 - High and Reliable ECC capability up to 16bits/sector
 - TRIM
- **RoHS compliant**
- **Conformal Coating**
- **MTBF:**>4,000,000 Hours @40C (Tested with Telcordia SR-332 standard)

2. Functional Block Diagram

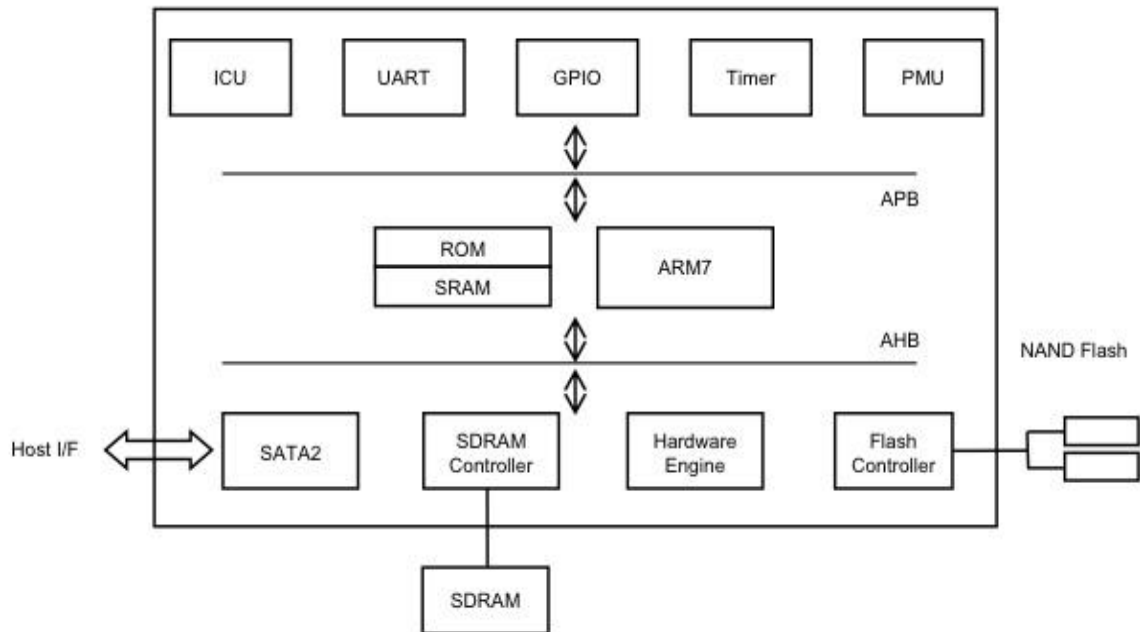


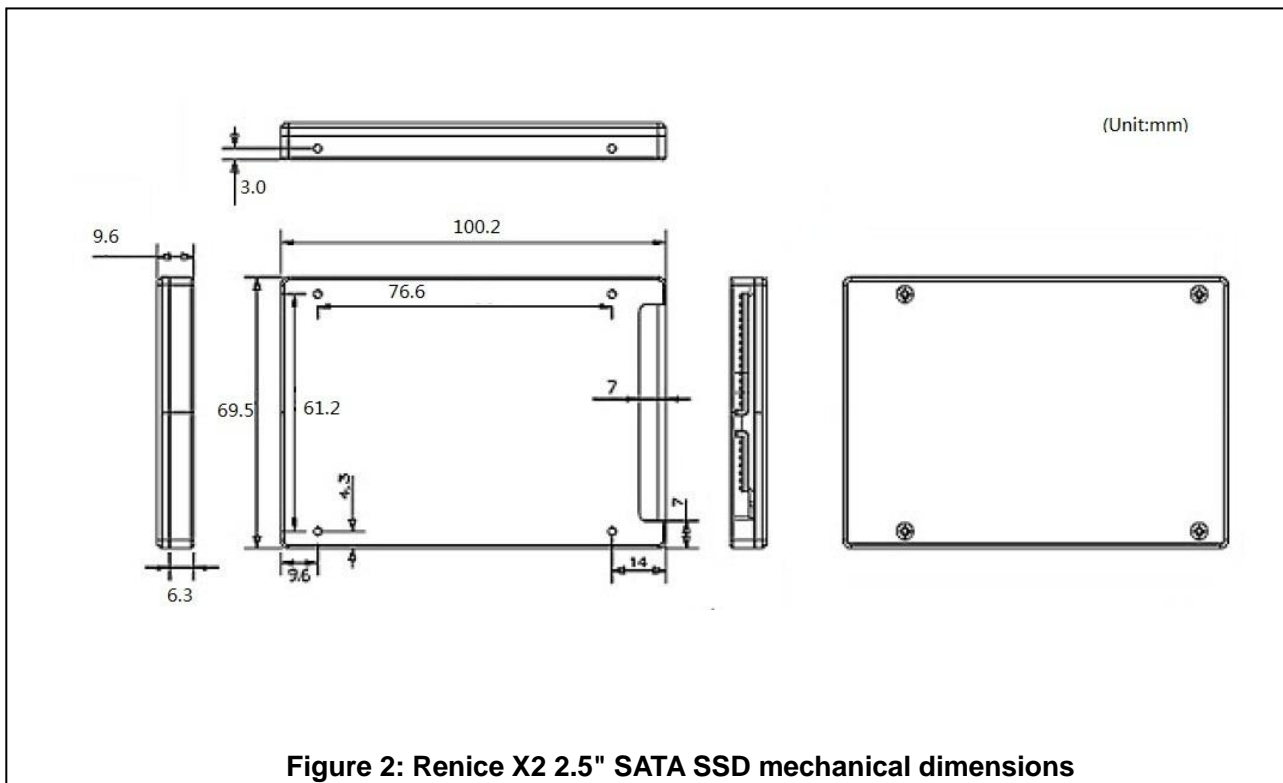
Figure 1: Renice X2 2.5" SATA SSD Block Diagram

3. Product Specifications

3.1 Physical Specifications

Table 1 Physical Specifications

Form Factor	2.5 INCH	
Dimensions	Length	100.2mm
	Width	69.5mm
	Height	9.6mm
Weight	<76g	
Connector	SATA II 7+15 pin	



3.2 Host Interface

Fully compliant with SATA revision 2.6, compatible with SATA 1.5Gb/s and 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

3.3 Internal MROM for Boot-loader

Robust Firmware Corruption

Maintenance and diagnostics program in MROM for recovering from drive malfunction

3.4 H/W Acceleration Engine

Internal SRAM and external DRAM search engine

3.5 Mobile SDRAM Interface

64MB buffer memory by Flash capacity

3.6 Capacity Specification

Table 2: Device parameters

Capacity	LBA	Cylinders	Heads	Sectors	User capacity(MB)
8GB	14442365	16383	16	63	7051.94
16GB	29323728	16383	16	63	14318.23
32GB	62533296	16383	16	63	30533.84
64GB	125045424	16383	16	63	61057.34
128GB	250069680	16383	16	63	122104.3
256GB	500118192	16383	16	63	244193.3

4. Interface Description

FRONT

4.1 Pin Ass



BOTTOM

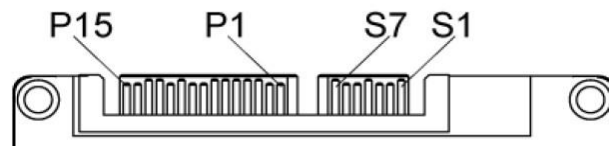


Figure 3: Pin Assignments

4.2 Pin Description

Table 3: Signal and Power segment

Pin No.	Pin Name	Pin No.	Pin Name
S1	GND	P1	+3.3V(Unused)
S2	SATA Differential RX+ based on SSD	P2	+3.3V(Unused)
S3	SATA Differential RX- based on SSD	P3	+3.3V(Unused)
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	+12V(Unused)

		P14	+12V(Unused)
		P15	+12V(Unused)

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, 1.8V for SDRAM

5.3 Power Consumption (typical)

Operation (Read/Write) – 1.0W

Idle – 0.4W

Standby - 0.4W

Sleep (Partial/Slumber) - 0.4W/0.15W

6. Reliability Specification

6.1 Environment

Table 4: Environmental Specifications

Item	Features	
Temperature	Operation	Industrial: -40~85°C
	Storage	-50~95°C
Humidity	5-95%	
Vibration	20G(7-2000HZ)	
Shock	2,000G(@0.3ms half sine wave)	

6.2 Wear-leveling

Renice 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 Endurance

Read endurance: unlimited

6.4 H/W ECC and EDC for NAND Flash

6,12 bytes/sector correctable by RS mode

8, 12,16bits/sector correctable by BCH mode

6.5 MTBF

MTBF (Mean Time between Failures) of Renice SSD: >4,000,000 Hours @40C (Tested with Telcordia SR-332 standard)

7. 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				

8. SMART

8.1 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 autosave
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)

8.2 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)

9. Ordering Information

Table 8: Valid Combinations

Capacity	MLC Part Numbers	SLC Part Numbers
8GB	RIM008-SX22	RIS008-SX22
16GB	RIM016-SX22	RIS016-SX22
32GB	RIM032-SX22	RIS032-SX22
64GB	RIM064-SX22	RIS064-SX22
128GB	RIM128-SX22	RIS128-SX22
256GB	RIM256-SX22	N

10. Part Number Naming Rule

