2013

RENICE X5 Half SlimSATA SSD DATASHEET

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CATALOGUE

1 Introduction

1.1 Product Overview

Renice X5 Half Slim SATA SSD is an embedded flash storage which is fully compliant with industrial JEDEC MO-297 standard, it is available with both MLC and SLC types.
With compact size, high performance and reliability, Renice X5 Half Slim SATA SSD is ideal storage solution for embedded applications, data centric servers, tablet PC, storage devices, etc.

1.2 Feature

●Performance:
Host Transfer Rate: 300MB/s
Max Sequential Data Read/Write: 240MB/145MB/s (MLC)
240MB/180MB/s (SLC)
● Form factor: Half Slim 54.0mm x 39.0mm x 4.0mm (LxWxH)
● Weight: <10g
● Interface standard: 7+15pin SATAII 3.0Gb/s
● Density: 8GB~256GB (MLC)
2GB~128GB (SLC)
● Input voltage: 5V (±5%)
● Standard operating temperature range from 0 to +70°C
● Industrial operating temperature range from -40 to +85°C
● Storage temperature range from -55 to +95°C
● 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
● Data retention: 10 years
● MTBF: >3,000,000 Hours @25C

2 Functional Block Diagram

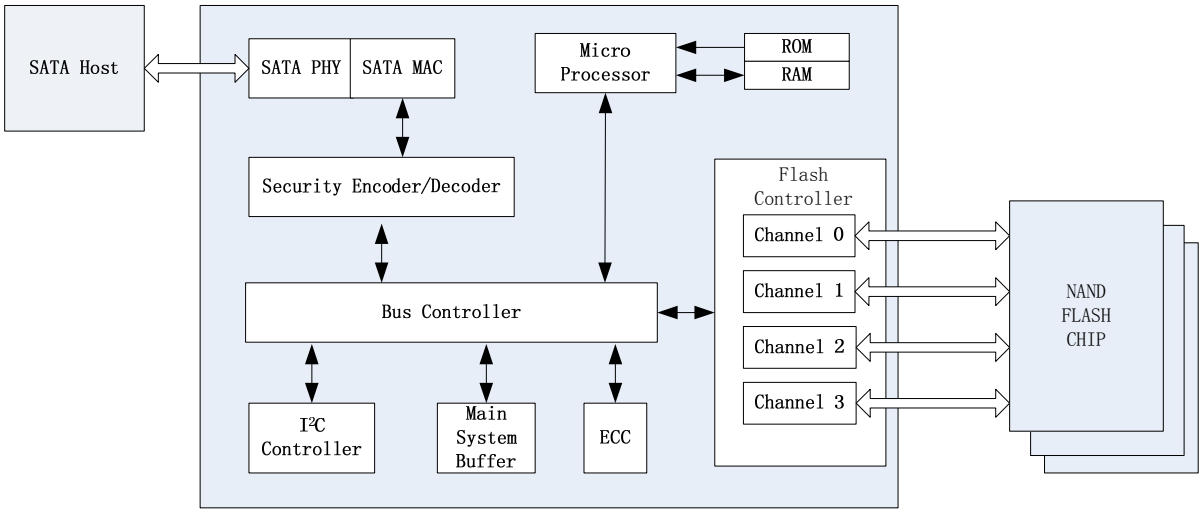

Figure 1: Functional Block Diagram

3 Physical Specification

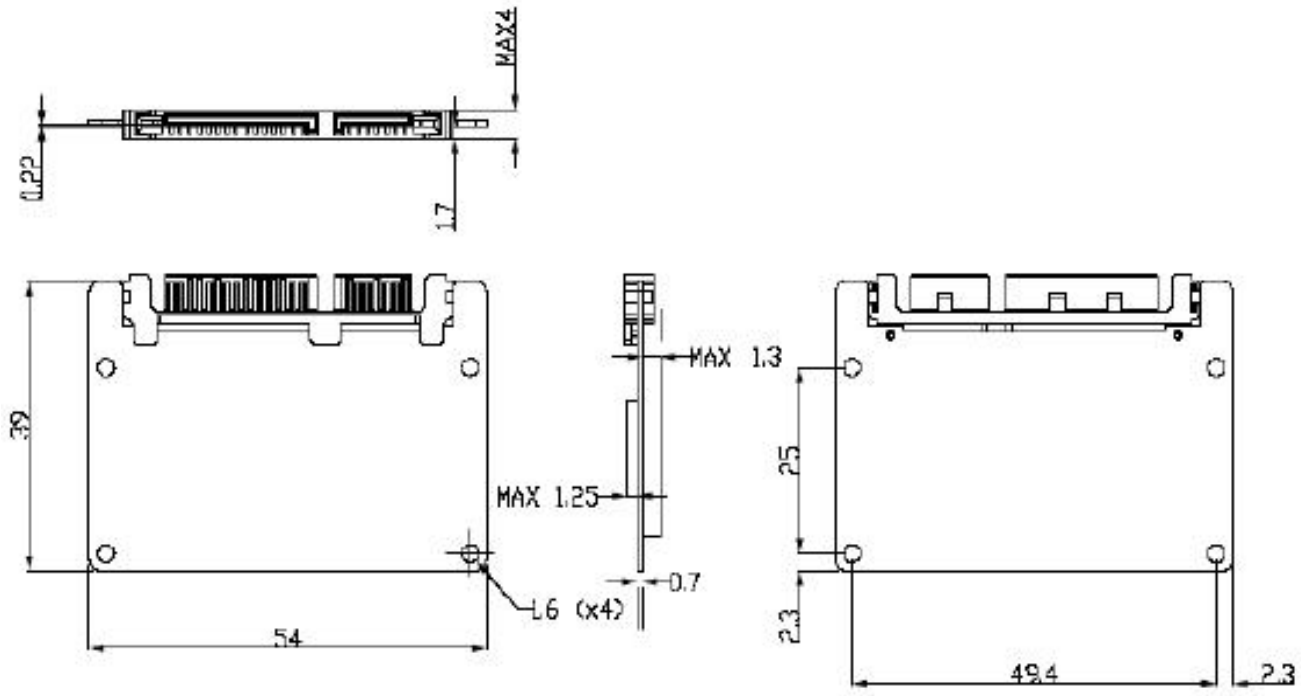

Figure 2: Mechanical Diagram

4 Host Interface

. Seamless SATA interoperability
. Plug-and-play field-proven SATA-v2.6-compliant interface
. 3 Gbps / 1.5 Gbps signaling (auto-negotiated)
. S.M.A.R.T. command transport (SCT) technology

5 Pin out information

5.1 Pin Assignment

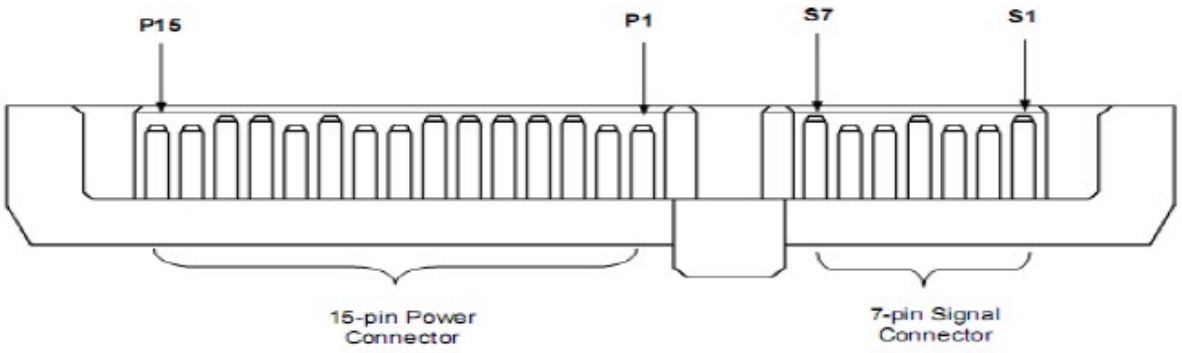

Figure 3: Pin Assignment

5.2 Connector Pin Signal Definitions

Table 1:Connector Pin Signal Definitions

Pin	Definitions
S1	GND
S2	SATA Differential RX+ based on SSD
S3	SATA Differential RX- based on SSD
S4	GND
S5	SATA Differential TX- based on SSD
S6	SATA Differential TX+ based on SSD
S7	GND
P1	+3.3V(Unused)
P2	+3.3V(Unused)
P3	+3.3V(Unused)
P4	GND
P5	GND
P6	GND
P7	+5V
P8	+5V
P9	+5V
P10	GND
P11	DAS/DSS
P12	GND
P13	+12V(Unused)
P14	+12V(Unused)
P15	+12V(Unused)

6 Power Specification

6.1 Operating Voltage:

Operating voltage: 5V (±5%)

6.2 Power Supply Voltage

1.2v for Core, 3.3V for NAND and Core.

6.3 Power Consumption(typical)

Operation (Read/Write) – 1.02W/1.2W
Standby - 0.45W
Sleep (Partial/Slumber) - 0.5W/0.26W

7 Reliability Specification

Table 2: Reliability Specification

Item	Features	
Temperature	Operation	Standard: 0~70°C
		Industrial: -40~+85°C
	Storage	-55~+95°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, ±X,±Y,±Z axis, 1 time/axis) Peak Acceleration: 50 G, 11ms(Half-sine wave, ±X,±Y,±Z axis, 3 times/axis)	

7.1 Wear-leveling

Renice X5 mSATA SSD supports 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.

7.2 H/W ECC and EDC for NAND Flash

Supports hardware BCH ECC engine: 72-bit per 1 KB

7.3 Power Failure Protection

Renice X5 mSATA SSD adopts Voltage Detector Circuit to detect current voltage status, when current voltage is detected abnormal, the controller will stop the data to be written into SSD, and prevent data loss in case of sudden power failure.

8 Command Set

Renice X5 mSATA SSD supports the commands as shown in the following table

Table 3: Command Set List

Command	Code	Protocol
General Feature Set		
Execute Drive Diagnostic	90h	Device diagnostic
Flush Cache	E7h	Non-data
Identify Device	ECh	PIO data-in
Read DMA	C8h	DMA
Read Multiple	C4h	PIO data-in
Read Sector(s)	20h	PIO data-in
Read Verify Sector(s)	40h or 41h	Non-data
Set Feature	Efh	Non-data
Set Multiple Mode	C6h	Non-data
Write DMA	Cah	DMA
Write Multiple	C5h	PIO data-out
Write Sector(s)	30h	PIO data-out
NOP	00h	Non-data
Read Buffer	E4h	PIO data-in
Write Buffer	E8h	PIO data-out
Power Management Feature Set		
Check Power Mode	E5h or 98h	Non-data
Idle	E3h or 97h	Non-data
Idle Immediate	E1h or 95h	Non-data
Sleep	E6h or 99h	Non-data
Standby	E2h or 96h	Non-data

Command	Code	Protocol
Standby Immediate	E0h or 94h	Non-data
Security Mode Feature Set		
Security Set Password	F1h	PIO data-out
Security Unlock	F2h	PIO data-out
Security Erase Prepare	F3h	Non-data
Security Erase Unit	F4h	PIO data-out
Security Freeze Lock	F5h	Non-data
Security Disable Password	F6h	PIO data-out
SMART Feature Set		
SMART Disable Operations	B0h	Non-data
SMART Enable/Disable Auto save	B0h	Non-data
SMART Enable Operations	B0h	Non-data
SMART Return Status	B0h	Non-data
SMART Execute Off-Line Immediate	B0h	Non-data
SMART Read Data	B0h	PIO data-in
Host Protected Area Feature Set		
Read Native Max Address	F8h	Non-data
Set Max Address	F9h	Non-data
Set Max Set Password	F9h	PIO data-out
Set Max Lock	F9h	Non-data
Set Max Freeze Lock	F9h	Non-data
Set Max Unlock	F9h	PIO data-out
48-bit Address Feature Set		
Flush Cache Ext	Eah	Non-data
Read Sector(s) Ext	24h	PIO data-in
Read DMA Ext	25h	DMA
Read Multiple Ext	29h	PIO data-in
Read Native Max Address Ext	27h	Non-data
Read Verify Sector(s) Ext	42h	Non-data
Set Max Address Ext	37h	Non-data
Write DMA Ext	35h	DMA
Write DMA FUA Ext	3Dh	DMA
Write Multiple Ext	39h	PIO data-out
Write Multiple FUA Ext	Ceh	PIO data-out
Write Sector(s) Ext	34h	PIO data-out

8.1 IDENTIFY DEVICE

The IDENTIFY DEVICE command enables the host to receive parameter information from the device. The following table gives the definition and value of each field in the Identify Device Information.

Table 4: Identify Device Parameters

Word	F / V	Default Value	Data Field Type Information
0	F	044Ah	General configuration
1	X	XXXXh	Default number of cylinders
2	V	0000h	Reserved
3	X	00XXh	Default number of heads
4	X	0000h	Obsolete
5	X	0240h	Obsolete
6	F	XXXXh	Default number of sectors per track
7 – 8	V	XXXXh	Number of sectors per card (Word 7= MSW, Word 8 = LSW)
9	X	0000h	Obsolete
10 – 19	F	XXXXh	Serial number in ASCII (Right justified)
20	X	0002h	Obsolete
21	X	0002h	Obsolete
22	X	0000h	Obsolete
23 – 26	F	XXXXh	Firmware revision in ASCII. Big Endian Byte Order in Word.
27 – 46	F	XXXXh	Model number in ASCII (Left justified).Big Endian Byte Order in Word.
47	F	8001h	Maximum number of sectors on Read/Write Multiple command
48	F	0000h	Reserved
49	F	0F00h	Capabilities
50	F	4000h	Capabilities
51	F	0200h	PIO data transfer cycle timing mode
52	X	0000h	Obsolete
53	F	0007h	Field validity
54	X	XXXXh	Current numbers of cylinders
55	X	XXXXh	Current numbers of heads

Word	F / V	Default Value	Data Field Type Information
56	X	XXXXh	Current sectors per track
57 – 58	X	XXXXh	Current capacity in sectors (LBAs)(Word 57 = LSW , Word 58 = MSW)
59	F	0100h	Multiple sector setting
60 – 61	F	XXXXh	Total number of sectors addressable in LBA Mode
62	X	0000h	Reserved
63	F	0007h	Multiword DMA transfer Supports MDMA Mode 0, 1 and 2
64	F	0003h	Advanced PIO modes supported
65	F	0078h	Minimum Multiword DMA transfer cycle time per word
66	F	0078h	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 – 74	F	0000h	Reserved
75	F	001Fh	Queue depth
76	F	0006h	Serial ATA capabilities Supports Serial ATA Gen1 Supports Serial ATA Gen2
	F	0206h	• Supports receipt of host-initiated interface power management requests
77	V	0000h	Reserved
78	F	0008h	Device supports initiating interface power management
79	V	0000h	Reserved
80	F	0080h	Major version number (ATAPI-7)
81	F	0000h	Minor version number
82	F	742Bh	Command sets supported 0
83	F	5500h	Command sets supported 1
84	F	4002h	Command sets supported 2
85 – 87	V	XXXXh	Command set/feature enabled
88	V	007Fh	Ultra DMA mode supported and selected

Word	F / V	Default Value	Data Field Type Information
89	F	0003h	Time required for Security erase unit completion
90	F	0000h	Time required for Enhanced security erase unit completion
91	V	0000h	Current Advanced power management value
92	V	FFFEh	Master Password Revision Code
93 – 99	V	0000h	Reserved
100 – 103	V	XXXXh	Maximum user LBA for 48-bit Address feature set
104 – 127	V	0000h	Reserved
128	V	0001h	Security status
129 – 159	X	0000h	Vendor unique bytes
160	F	0000h	Power requirement description
161	X	0000h	Reserved
162	F	0000h	Key management schemes supported
163	F	0000h	CF Advanced True IDE Timing Mode Capability and Setting
164 – 216	V	0000h	Reserved
217	F	0100h	Non-rotating media (SSD)
218 – 255	X	0000h	Reserved

Notes:

1.F = content (byte) is fixed and does not change.

2.V = content (byte) is variable and may change depending on the state of the device or the commands executed by the device.

3.X = content (byte) is vendor specific and may be fixed or variable

9 SMART

9.1 SMART Command Set

Table 5: 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

9.2 SMART Attribute Data Structure

Table 6: 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 7: Valid Combinations

Capacities/Flash type	Standard Temp	Industrial Temp
2GB/SLC	RCS002-SX5H	RIS002-SX5H
4GB/SLC	RCS004-SX5H	RIS004-SX5H
8GB/SLC	RCS008-SX5H	RIS008-SX5H
16GB/SLC	RCS016-SX5H	RIS016-SX5H
32GB/SLC	RCS032-SX5H	RIS032-SX5H
64GB/SLC	RCS064-SX5H	RIS064-SX5H
128GB/SLC	RCS128-SX5H	RIS128-SX5H
8GB/MLC	RCM008-SX5H	RIM008-SX5H
16GB/MLC	RCM016-SX5H	RIM016-SX5H
32GB/MLC	RCM032-SX5H-	RIM032-SX5H
64GB/MLC	RCM064-SX5H	RIM064-SX5H
128GB/MLC	RCM128-SX5H	RIM128-SX5H
256GB/MLC	RCM256-SX5H	RIM256-SX5H

11 Part Number Naming Rule