

Renice Technology Co., Limited

X9 2.5" SATAIII SSD

DATASHEET



V1.0

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1. Introduction

1.1 Product Overview

The Renice X9 SSD is one high-end product for a variety of applications, including industrial, automotive electronics, medical equipment, military, aerospace and maritime industry, as well as enterprise solutions where data throughput needs to be high.

Utilizing the unique firmware architecture, the X9 provides high reliability and durability. Besides, over-voltage protection, sudden power loss protection, AES 128bit/256bit Encryption and multiple Secure Erase according to customer's applications, all these features make X9 a first-choice for mission critical applications.

1.2 Feature

- **HOST Interface:** SATA III, 6.0Gbps (Backward compatible with SATA 1.5 and 3.0Gbps)
- **Form factor:** 2.5 inch (100.0mmX70.0mmX9.5mm) LxWxH
- **Connector:** 7-pin signal segment and a 15-pin power segment
- **Performance:**
 - Max Sequential Data Read/Write: 520/450MB/s
 - Read/Write IOPS: 75,000 / 65,000
 - Access Time: <0.1ms
- **Capacities:** 256GB, 512GB, 1TB, 2TB (MLC)
128GB, 256GB, 512GB, 1TB (SLC)
- **Power Management:**
 - Input voltage: 5V (±5%)
- **Temperature ranges:**
 - Operation: -40°C to +85°C (Industrial)
 - Storage: -50°C 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 8~80bits in 1KBytes
 - Support Power Failure Protection
 - TRIM support
 - Support AES-128/256 bits
 - Support Secure Erase
 - Support Physical Destruction
 - Support Interface Power Management
 - Support Spread-Spectrum Clocking
 - MLC supports 3,000 times P/E cycle
- **MTBF:** >4,000,000 Hours @25C



2. Functional Block Diagram

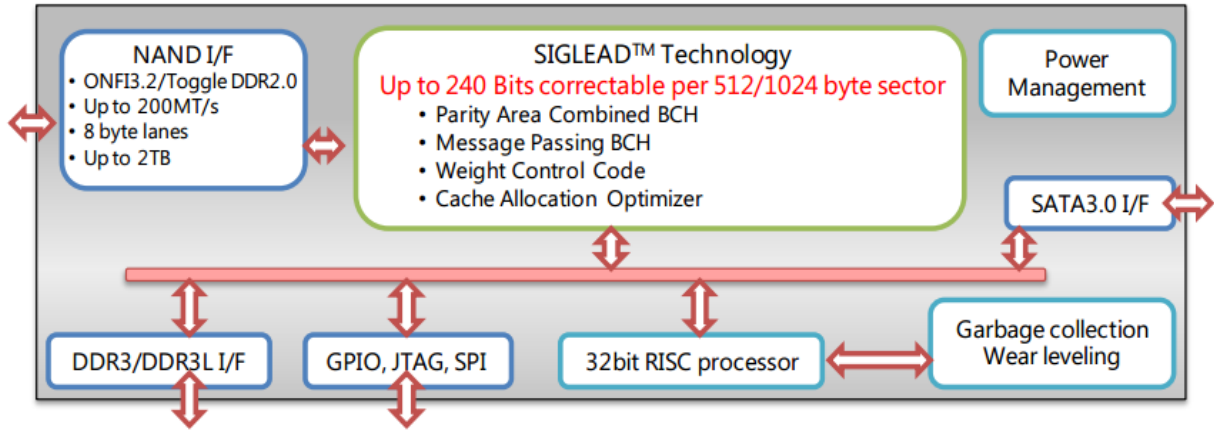


Figure 1 Renice X9 2.5" SATAIII SSD Block Diagram

3. Product Specifications

3.1 Physical Specifications

Table 2 Physical Specifications

Form Factor		2.5 INCH
Dimensions	Length	100±0.25mm
	Width	70.0±0.25mm
	Height	9.5±0.25mm
Weight		85g
Connector		SATA II 7+15 pin

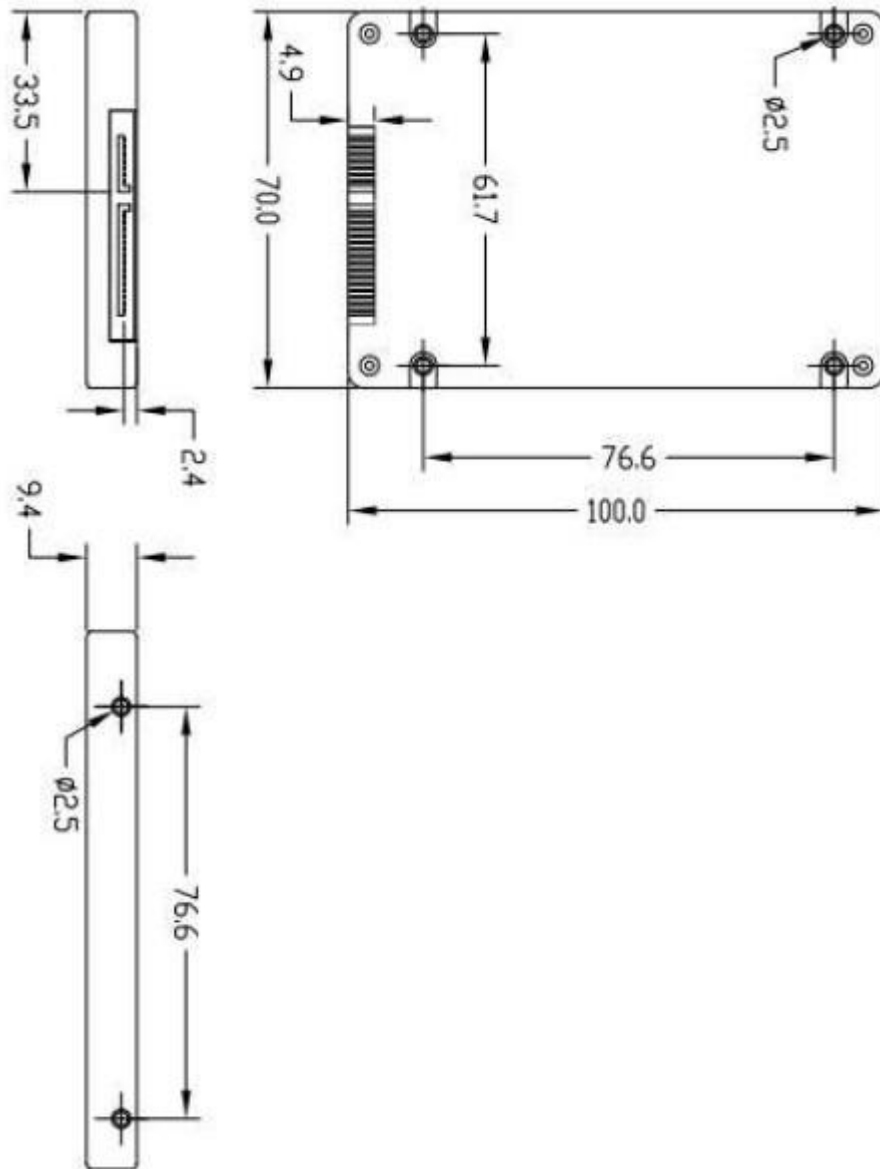


Figure 3 Renice X9 2.5" SATAIII SSD mechanical dimensions

3.2 Host Interface

1.5/3.0/ 6.0Gbps SATA I/II/III interface

Native Command Queuing (NCQ)

Spread-Spectrum Clocking (SSC)

Interface Power Management (IPM)



4. Interface Description

4.1 Pin Assignment

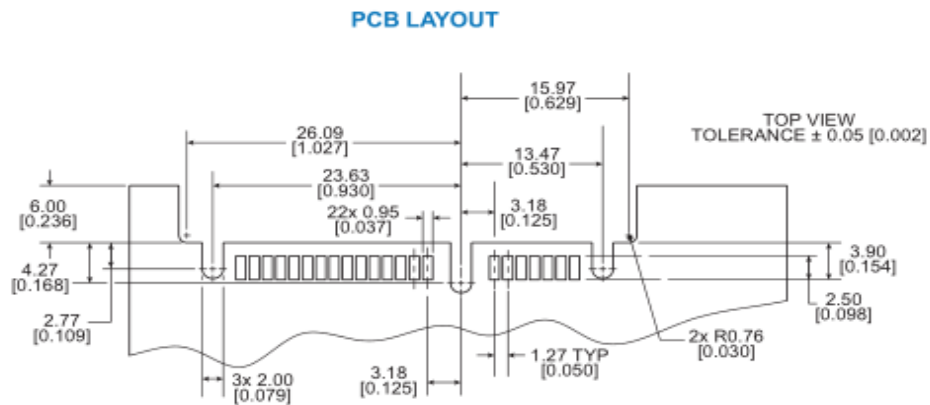


Figure 4: Pin Assignments

4.2 Pin Description

Table 5 Polarity definition

Polarity	Definition
A	Analog
D	Digital
I	Input
O	Output
IO	Input and Output
Pu	Internal Pull-Up
Pd	Internal Pull-Down
S	Schmitt
P	Power / GND
2	Output drive capability = 2mA
4	Output drive capability = 4mA
8	Output drive capability = 8mA
24	Output drive capability = 24mA


Table 6 Power voltage definition

Signal Name	Polarity	Ball No.	Description
VDDQ	DP	N5, N6, N7, P5, P6, P7, R5, R6, R7, T10, T11, T5, T6, T7, T8, T9, U10, U11, U12, U5, U6, U7, U8, U9	DDR IO_Power(1.35V or 1.5V)
VDD18	DP	F10, F14, F15, F7, F8, F9, G15, H15, J6, K6, L6, M16, N16, P16, R16	IO_Power(3.3V or 1.8V)
AVDD33	AP	H2	3.3V Power for Analog
VDD12	DP	E6, E7, E8, E9, F11, F12, F13, F6, G6, H6, J15, K16, K5, L16, L17, L5, M17, M5, M6, N17, P17, R17, R18, T12, T13, T14, T15, T16, T17, T18, U13, U14, U15, U16, U17, V13	Core_Power(1.2V)
AVDD12	AP	F2, G2, J4, K4, L4	1.2V Power for Analog
AVSS12	AP	J3, K3, L3	GND for Analog
VSS	DP	G10, G11, G12, G13, G14, G5, G7, G8, G9, H10, H11, H12, H13, H14, H5, H7, H8, H9, J10, J11, J12, J13, J14, J5, J7, J8, J9, K10, K11, K12, K13, K14, K15, K7, K8, K9, L10, L11, L12, L13, L14, L15, L7, L8, L9, M10, M11, M12, M13, M14, M15, M7, M8, M9, N10,	GND
		N11, N12, N13, N14, N15, N8, N9, P10, P11, P12, P13, P14, P15, P8, P9, R10, R11, R12, R13, R14, R15, R8, R9	

(*)short-circuit between AVSS12 and VSS in the chip

Table 7 SATA Signal

Signal Name	Polarity	Ball No.	Description
SRX_P	AI	F1	SATA Rx+ (*1)
SRX_M	AI	G1	SATA Rx - (*1)
STX_P	AO	J1	SATA Tx+ (*1)
STX_M	AO	H1	SATA Tx- (*1)
SREFRES	AI	J2	SATA Reference Resistor(200Ω ±1%) Please connect a resistor (200Ω ±1%) to VSS pin between this pin.

(*1) the capacity of coupling capacitor shall be 10nF



5. Power Specifications

5.1 Operating Voltage

Operating voltage: 5V (±5%)/ 12V (±5% - Physical burned dedicated powersupply)

5.2 Power Supply Voltage

1.2V for Core, 1.35V for DDR3, 1.8V for IO and SPI Flash, 3.3V for NAND

5.3 Power Consumption (typical)

Operation (Read/Write) –3W/10W@2TB
 Idle–1.5W

6. Reliability Specification

6.1 Environment

Table 8 Environmental Specifications

Item	Features	
Temperature	Operation	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, ±X,±Y,±Z axis, 1 time/axis)	

6.2 Wear-leveling

Renice X9 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.



6.3 H/W ECC and EDC for NAND Flash

Programmable BCH strength (8-bit ~ 80-bit) and Codeword size (512/1024 Bytes) .

6.4 Power Failure Protection

Renice X9 2.5" SATA SSD adopts on board DDR and Tantalum capacitor. Data will be written to DDR firstly and then to NAND flash. In case of Power Loss, the Capacitor will support the transferring of Data from DDR to NAND flash. .

6.5 Endurance

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

Read endurance: JESD47 compliant

6.6 MTBF

MTBF (Mean Time between Failures) of Renice X9 SSD: >4,000,000 Hours @25C

7. Secure Erase Function (Optional)

Renice X9 SATA SSD can support Secure Erase (SE) function with a Hardware Key* for emergency data erasure based on customers' requests. Secure Erase can be triggered by pressing the SE Key. The process of erasure will not be stopped until finished, even if power failure happens, it will be continued automatically when power is back on.

No matter Renice X9 SATA SSD is acting as master Drive or slave drive, once the Secure Erase function is triggered, SE will be carried out immediately whether the SSD is in idle mode (no read/write) or work (read/write) mode.

Hardware key*: The X9 SATA SSD is designed with an external K2 key located in the tail of the drive or a client's external switch or button can be connected to P1 (P14) to trigger the SE function.



7.1 Technical Concept

The SE command is transmitted to controller chip from the GPIO of the IO expanding chip, SE could be triggered by pulling GPIO down for 3 seconds whether through H/W (i.e. external switch or button) or S/W, the controller will then send Delete Command to NAND Flash to start SE.

a. Trigger Time: 0~3 seconds (The time could be adjusted through firmware)

Controller will take it as mis-operation and no SE command will be sent.

b. Trigger Time: 3~10 seconds (The time could be adjusted through firmware)

All data on board will be deleted and data of FF pattern will be written in.

7.2 SE Type

The specific SE type of X9 SATA SSD is similar to NTISSP-9 which is one SE standard commonly seen from SSD solutions on market, however X9 only executes the SE command for one time. **(Note: The SE function of Renice X9 solution could be customized based on clients' standard.)**

X9 SE is done by 2 steps, Erase and Write.

1. Erase: Every memory block on the board is erased;

2. Write: Every Memory Chips location is recorded with a pattern FF.

So if clients need other types of SE, please forward us specific standards. And our R&D will figure out the feasibility.

7.3 Time taken for SE

Scenario 1: only Mapping Table deleted. Data on disk could be recovered maliciously.

Around 5 seconds

Scenario 2: Both Mapping Table and memory storage blocks are deleted. And disk will be written in fully with data of meaningless pattern.

Theoretical formula for Scenario 2:

e.g. Micron MT29F64G08CBABA NAND flash.

8GB=4096 BLOCK;

Each Block Erase needs 3ms based on Flash Data Sheet

Controller Used 2 plan and Interleave mode to scan the data;

Time=4096*3ms/2/1.5 = 4 Seconds

Plan: the same meaning with Channel for the Data transmission;



Interleave: used for enhance the Data transmission speed In One Channel; Interleave value depends on NAND deployed, which is usually between 1.0 and 2.0. In our example we use 1.5 as a convenient median.

8. Physical Destruction (Optional)

8.1 Physical Destruction Technology and Procedures

Renice X9 SATA SSD is designed with a dedicated circuit providing 12V of additional power for burning the internal wafer circuit of each NAND Flash thoroughly to reach the purpose of destructing data physically.

To execute Physical Destruction, an external hardware button is requested to connect with P3 of SATA connector. Touch the button for more than 5 seconds to trigger the physical data destruction function and start burning the NAND flashes, the destruction won't be stopped even if the power is stopped, it will start automatically when power is on.

8.2 Physical Destruction Pin Definition

Table 9 Physical Destruction Pin Definition

Pin No.	Pin Name	Pin No.	Pin Name
S1	GND (2 nd mate)	P1	SE
S2	SATA Differential RX+ based on SSD	P2	SE_LED
S3	SATA Differential RX- based on SSD	P3	PD5S
S4	GND(2 nd mate)	P4	GND
S5	SATA Differential TX- based on SSD	P5	GND
S6	SATA Differential TX+ based on SSD	P6	GND
S7	GND(2 nd mate)	P7	+5V
		P8	+5V
		P9	+5V
		P10	GND
		P11	DAS_OUT
		P12	GND
		P13	+12V
		P14	+12V
		P15	+12V



9. Write Protection Function (Optional)

Renice X9 SATA SSD can support write protection function based on customers' request with a Hardware Button*. Write protection can be enabled by operating the Write Protection button. Once write protect function triggered, the whole disk could be for read only, in that case, no more data could be written into the disk to avoid the virus infection.

Hardware Button*: Renice X9 SATA SSD is designed with Write Protection jumper connector, the client is requested to connect an external hardware touch switch/button to operate the Write Protection function.



10. Ordering Information

Table 10 Valid Combinations

Capacities/Flash type	Industrial Temp	Part Number
128GB/SLC	-40°C to +85°C	RIS128-S3X92
256GB/SLC	-40°C to +85°C	RIS256-S3X92
512GB/SLC	-40°C to +85°C	RIS512-S3X92
1TB/SLC	-40°C to +85°C	RIS01T-S3X92
256GB/MLC	-40°C to +85°C	RIM256-S3X92
512GB/MLC	-40°C to +85°C	RIM512-S3X92
1TB/MLC	-40°C to +85°C	RIM01T-S3X92
2TB/MLC	-40°C to +85°C	RIM02T-S3X92



11.Part Number Naming Rule

