Renice Technology Co., Limited

X9 2.5” SAS SSD

Physical Destruction DATASHEET

V1.0

2016-11-03

CATALOGUE

1. INTRODUCTION....2

1.1 PRODUCT OVERVIEW....2
1.2 FEATURE....2

2. FUNCTIONAL BLOCK DIAGRAM....3

3. PRODUCT SPECIFICATIONS....3

3.1 PHYSICAL SPECIFICATIONS....3
3.2 HOST INTERFACE....4

4. INTERFACE DESCRIPTION....5

4.1 PIN ASSIGNMENT....5
4.2 PIN DESCRIPTION....5

5. POWER SPECIFICATIONS....6

5.1 OPERATING VOLTAGE....6
5.2 POWER SUPPLY VOLTAGE....6
5.3 POWER CONSUMPTION (TYPICAL)....6

6. RELIABILITY SPECIFICATION....6

6.1 ENVIRONMENT....6
6.2 WEAR-LEVELING....6
6.3 H/W ECC AND EDC FOR NAND FLASH....7
6.4 POWER FAILURE PROTECTION....7
6.5 ENDURANCE....7
6.6 MTBF....7

7. SECURE ERASE FUNCTION (OPTIONAL)....7

7.1 TECHNICAL CONCEPT....8
7.2 SE TYPE....8
7.3 TIME TAKEN FOR SE....8

8. PHYSICAL DESTRUCTION (OPTIONAL)....9

8.1 PHYSICAL DESTRUCTION TECHNOLOGY AND PROCEDURES....9
8.2 PHYSICAL DESTRUCTION PIN DEFINITION....9

9. WRITE PROTECTION FUNCTION (OPTIONAL)....10

10.ORDERING INFORMATION....10

11.PART NUMBER NAMING RULE....11

1. Introduction

1.1 Product Overview

The Renice X9 SSD has a SAS (6Gbps) interface allowing for read/write speeds of 550/500MB per second. The X9 is ideal for a variety of applications, including enterprise solutions where data throughput needs to be high, as well as industrial installations where the potential for high shock and vibration conditions exist.
X9 series SSD carry up to 1GB DDR3 which gains high performance. Design using SLC/MLC NAND flash technology, and utilizing a unique firmware architecture, the X9 maximizes the bandwidth limitations of SAS giving up to 60,000 input/output operations per second(IOPS).

1.2 Feature

● **HOST Interface:** SAS, 6.0Gbps (Backward compatible with SAS 1.5/3.0/6.0Gbps)
● **Form factor:** 2.5 inch (100.0mmX70.0mmX9.5mm) L×W×H
● **Connector:** 7+7-pin signal segment and a 15-pin power segment
● **Performance:**
-Max Sequential Data Read/Write: 550/500MB/s
-Read/Write IOPS: 75,000 / 65,000
Access Time: <0.1ms
● **Capacities:** 256GB, 512GB, 1TB (MLC)
128GB,256GB,512GB (SLC)
● **Power Management:**
-Input voltage: 5V (±5%) 12V (±5%)
● **Temperature ranges:**
– Operation: -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 8~80bits in 1KBytes
– Support Power Failure Protection
– TRIM support
–Support AES-128/256 bits
–Support NCQ
–Support Interface Power Management
–Support Spread-Spectrum Clocking
● **MTBF:** >3,500,000 Hours @25°C

2. Functional Block Diagram

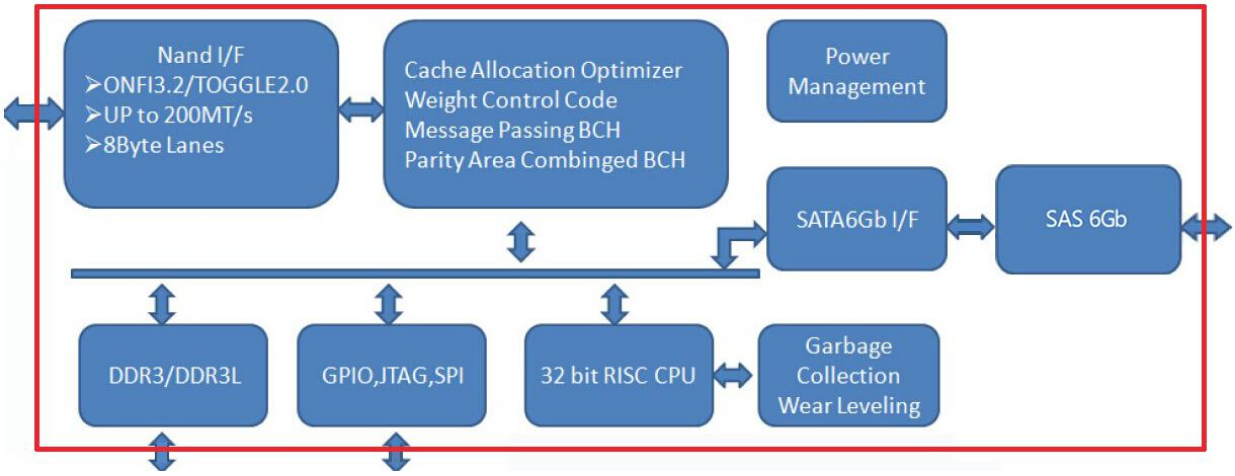


Figure 1 Renice X9 2.5" SAS SSD Block Diagram

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		/
Connector		SAS 7+15 pin

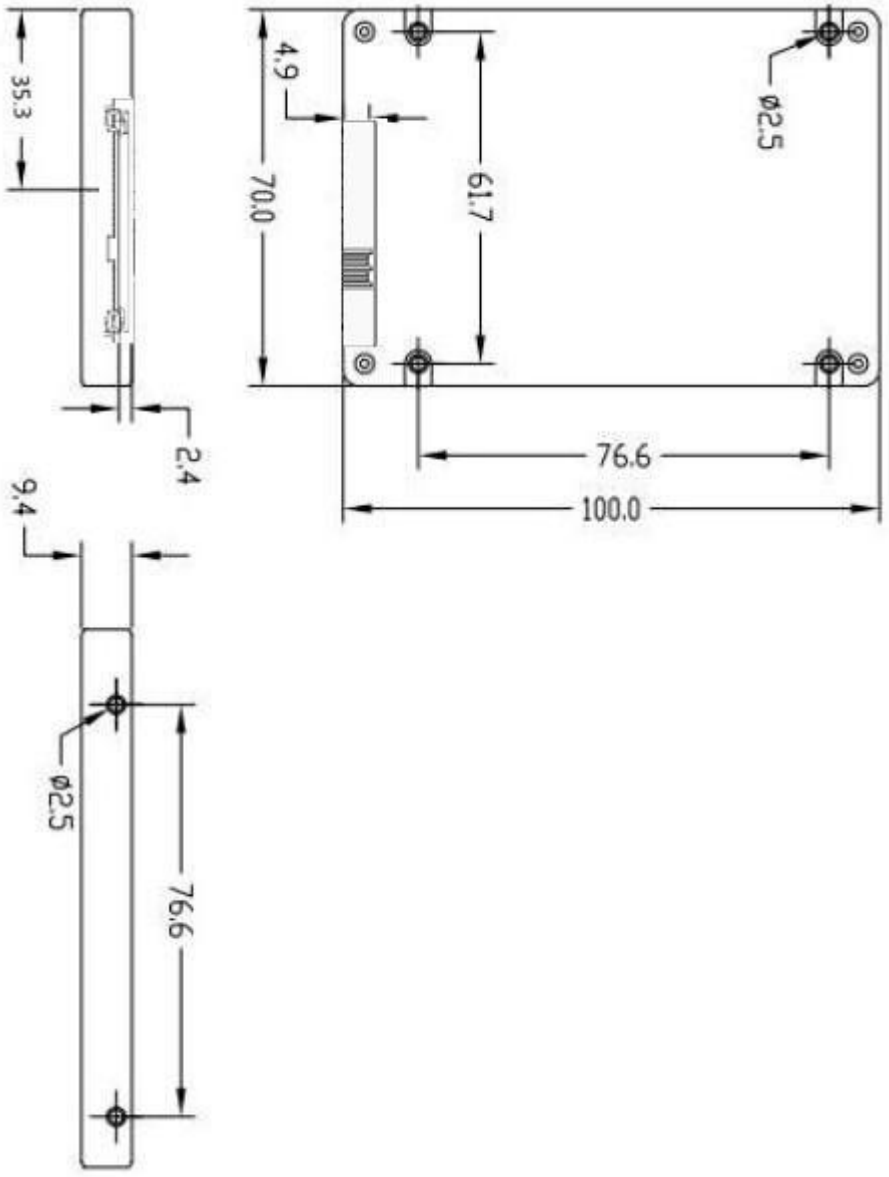


Figure 3 Renice X9 2.5" SAS SSD mechanical dimensions

3.2 Host Interface

3.0/6.0Gbps SAS interface
Native Command Queuing (NCQ)
Spread-Spectrum Clocking (SSC)
Interface Power Management (IPM)

4. Interface Description

4.1 Pin Assignment

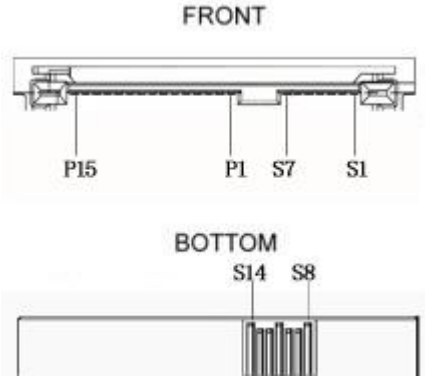


Figure 4: Pin Assignments

4.2 Pin Description

Table 5 Signal and Power segment

Pin No.	Pin Name	Pin No.	Pin Name
S1	GND (2nd mate)	P1	GPIO_Secure Erase(Optional)
S2	SAS0/SAS RX＋ based on SSD	P2	GPIO_SE/Physical destruction LED(Optional)
S3	SAS0/SAS RX－ based on SSD	P3	GPIO_Physical destruction (Optional)
S4	GND(2nd mate)	P4	GND
S5	SAS0/SAS TX－ based on SSD	P5	GND
S6	SAS0/SAS TX＋ based on SSD	P6	GND
S7	GND(2nd mate)	P7	+5V
S8	GND (2nd mate)	P8	+5V
S9	SAS1 RX＋ based on SSD	P9	+5V
S10	SAS1 RX－ based on SSD	P10	GND
S11	GND(2nd mate)	P11	DAS
S12	SAS1 TX－ based on SSD	P12	GND
S13	SAS1 TX＋ based on SSD	P13	V12 (No Power)
S14	GND(2nd mate)	P14	V12 (No Power)
		P15	V12 (No Power)

5. Power Specifications

5.1 Operating Voltage

Operating voltage: 5V (±5%) 12V (±5%-Physical destruction dedicated power supply)

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@1TB
Idle–1.5W

Physical destruction Power Consumption 50W

6. Reliability Specification

6.1 Environment

Table 6 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) Peak Acceleration: 50 G, 11ms(Half-sine wave, ±X,±Y,±Z axis, 3 times/axis)	

6.2 Wear-leveling

Renice X9 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

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

6.4 Power Failure Protection

Renice X9 2.5” SAS 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: >3,500,000 Hours @25°C

7. Secure Erase Function (Optional)

Renice X9 SAS 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 SAS 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 SAS 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 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 trigged 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: 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: 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 SAS 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.

Scenario 2: Both Mapping Table and memory storage blocks are deleted. And Disk status cannot be identified.

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 SAS 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（Low level effectively） of SAS 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.

The whole procedure of self-destructing can be finished in 45 seconds .

8.2 Physical Destruction Pin Definition

Table 7 Physical Destruction Pin Definition

Pin No.	Pin Name	Pin No.	Pin Name
S1	GND (2nd mate)	P1	GPIO_Secure Erase(Optional)
S2	SAS0/SATA RX＋ based on SSD	P2	GPIO_SE/Physical destruction LED(Optional)
S3	SAS0/SATA RX－ based on SSD	P3	GPIO_Physical destruction (Optional)
S4	GND(2nd mate)	P4	GND
S5	SAS0/SATA TX－ based on SSD	P5	GND
S6	SAS0/SATA TX＋ based on SSD	P6	GND
S7	GND(2nd mate)	P7	+5V
S8	GND (2nd mate)	P8	+5V
S9	SAS1 RX＋ based on SSD	P9	+5V
S10	SAS1 RX－ based on SSD	P10	GND
S11	GND(2nd mate)	P11	DAS
S12	SAS1 TX－ based on SSD	P12	GND
S13	SAS1 TX＋ based on SSD	P13	+12V
S14	GND(2nd mate)	P14	+12V
		P15	+12V

9. Write Protection Function (Optional)

Renice X9 SAS 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 SAS 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 8 Valid Combinations

Capacities/Flash type	Industrial Temp	Part Number
128GB/SLC	-40 to 85°C	RIS128-SAS2X92 RIS128-SAS3X92
256GB/SLC	-40 to 85°C	RIS256-SAS2X92 RIS256-SAS3X92
512GB/SLC	-40 to 85°C	RIS512-SAS2X92 RIS512-SAS3X92
256GB/MLC	-40 to 85°C	RIM256-SAS2X92 RIM256-SAS3X92
512GB/MLC	-40 to 85°C	RIM512-SAS2X92 RIM256-SAS3X92
1TB/MLC	-40 to 85°C	RIM01T-SAS2X92 RIM01T-SAS3X92

11.Part Number Naming Rule

