

ShenZhen Renice Technology Co., Ltd

X7 2.5" SATAIII SSD

Datasheet



V1.0

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1. Introduction

1.1 Product Overview

The Renice X7 series SSD is a high capacity SSD solution delivers solid I/O cost-to-performance benefits for applications that demand low latency read speeds and greater bandwidth for server and storage environments for SATA-based systems in capacities of 1TB, 2TB, 4TB and 8TB.

Designed with single-chip controller with a SATA interface on the host side and 8 channels of NAND Flash internally, packaged in an industry-standard 2.5-inch form factor, Renice X7 SSD is a good solution with the enhanced performance, reliability, ruggedness, and power saving.

By combining high capacity NAND Flash Memory technology with SATA 6Gb/s interface support, Renice X7 SSD delivers sequential read/ write speeds of up to 540MB/s. It is the highest performing industrial grade SSD specifically designed for the railway, aerospace, outdoor equipment and other rugged applications.

1.2 Feature

- **Standard Serial ATA:** SATA III, 6.0Gbps (Backward compatible with SATA 1.5 and 3.0Gbps)
- **Form factor:** 2.5 inch 100.0mm x 70.0mm x 7.0mm (L x W x H)
2.5 inch 100.0mm x 70.0mm x 9.5mm (L x W x H)
- **Connector:** 7-pin signal segment and a 15-pin power segment
- **Performance:**
 - Max Sequential Data Read/Write: 540MB/500MB/s
 - 4Kb Random Read/Write IOPS: 70,000 / 70,000
 - Read/Write Latency: 65µs/40µs (TYP)
 - Access Time: <0.1ms
- **Capacities:** 1TB, 2TB, 4TB, 8TB
- **Power Management:**
 - Input voltage: 5V (±10%)
 - Support Hot Plug/Removal Function
- **Temperature ranges:**
 - Operation: -40°C to +85°C
 - Storage: -50°C to +90°C
 - Temperature monitoring and logging
- **Intelligent features:**
 - Static and dynamic wear-leveling, bad block management algorithm
 - Self-Monitoring, Analysis and Reporting Technology
 - Support Power Failure Protection
 - Option for AES-256bit Encryption
 - Support TRIM
 - Support NCQ

- MTBF: >1.5 million hours³

2. Functional Block Diagram

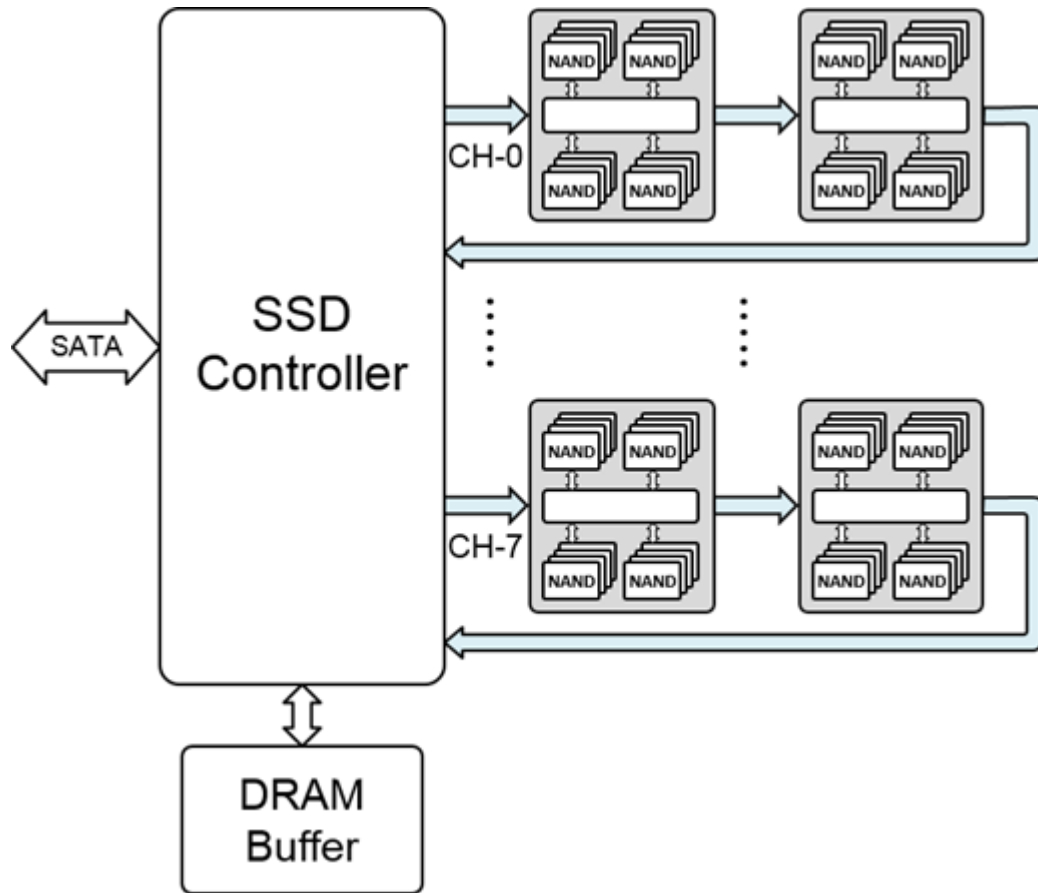


Figure 1: Renice X7 2.5" SATAIII SSD Block Diagram

3. Product Specifications

3.1 Physical Specifications

Table 1: Physical Specifications

Form Factor		2.5 INCH
Dimensions	Length	100.02±0.25mm
	Width	70.0±0.25mm
	Height	7.0±0.25mm (option for 9.5mm)
Weight		<100g
Connector		SATA III 7+15 pin

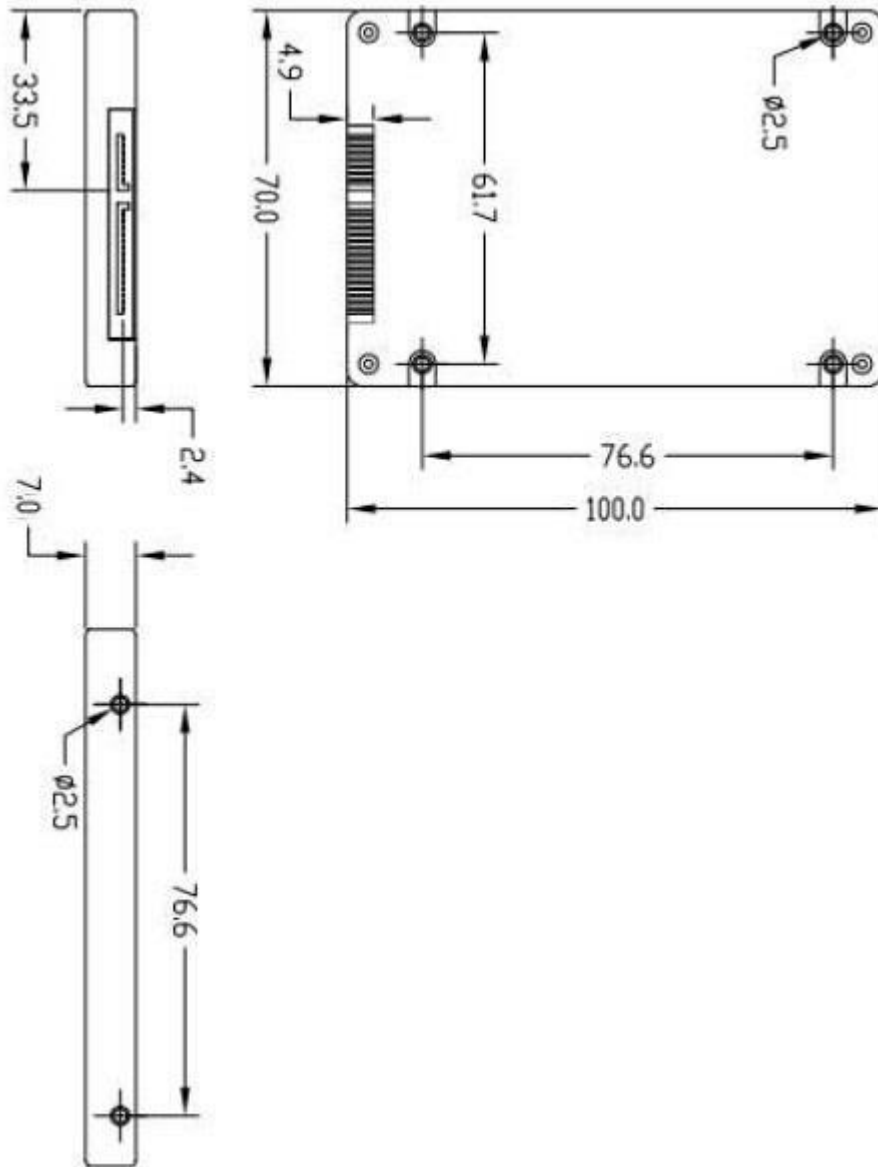


Figure 2: Renice X7 2.5" SATAIII SSD mechanical dimensions

3.2 Host Interface

Industrial Standard SATA Revision 3.0 compliant

Industrial Standard ATA8-ACS2 command compliant

Supports SATA interface rate of 6Gb/s(backward compatible to 1.5Gb/s and 3Gb/s)

Native Command Queuing (NCQ)

S.M.A.R.T. command transport (SCT) technology
 SATA Device Sleep (Dev Sleep)
 Data Set Management command (TRIM)

3.3 Capacity

Table 2: Capacity Specification

Parameter.	LBA Counts(512Byte)	Over-provision (%)
1TB	1,953,525,168	6.25
2TB	3,907,029,168	6.25
4TB	7,814,037,168	6.25
8TB	15,628,053,168	6.25

4. Interface Description

4.1 Pin Assignment

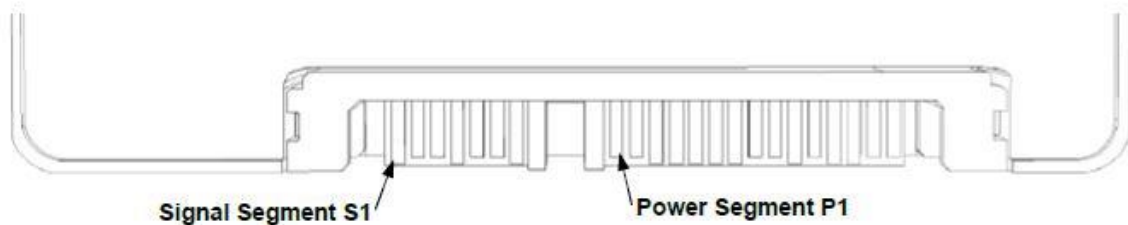


Figure 3: Pin Assignments

4.2 Pin Description

Table 3: Signal and Power segment

Pin No.	Pin Name	Pin No.	Pin Name
S1	GND	P1	Not Connect
S2	SATA Differential RX+ based on SSD	P2	Not Connect
S3	SATA Differential RX- based on SSD	P3	Not Connect
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
		P12	GND
		P13	Not Connect
		P14	Not Connect
		P15	Not Connect

5. Power Specifications

5.1 Operating Voltage

Operating voltage: 5V (±10%)

5.2 Power Consumption (typical)

Operation (Read/Write) – Up to 6.05W (8TB, Avg.)

Idle – Up to 2.73W (8TB, Avg.)

6. Reliability Specification

6.1 Environment

Table 4: Environmental Specifications

Item	Features	
Temperature	Operation	-40°C ~+85°C
	Storage	-50°C ~+90°C
Humidity	5-95%	
Vibration	10Hz-2,000Hz, 16.3G (X, Y, Z axis, 1 hour /axis)	
Shock	Peak Acceleration: 1,000G, 0.5ms (Half-sine wave, ±X, ±Y, ±Z axis, 1 time/axis)	

6.2 Wear-leveling

Renice X7 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 Power Failure Protection

Renice X7 2.5" SATA SSD designed with power-loss onboard 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.

6.4 MTBF

MTBF (Mean Time between Failures) of Renice X7 SSD: >1,500,000 Hours³ @25C

7. Supported ATA Command Lists

Table 5: Support ATA Command Lists

Command	Command Code
Check Power Mode	E5h or 98h
Device Reset	08h
DEVICE CONFIGURATION	
Device Configuration Freeze Lock	B1h/C1h
Device Configuration Identify	B1h/C2h
Device Configuration Restore	B1h/C0h
Device Configuration Set	B1h/C3h
Download Microcode	92h
Data Set Management	06h
Execute Device Diagnostic	90h
Flush Cache	E7h
Flush Cache Ext	EAh
Identify Device	ECh
Idle	E3h or 97h
Idle Immediate	E1h or 95h
Initialize Device Parameters	91h
Read Buffer	E4h
Read DMA	C8h
Read DMA EXT	25h
Read FPDMA Queued	60h
Read Log EXT	2Fh
Read Multiple	C4h
Read Multiple EXT	29h
Read Native Max Address	F8h
Read Native Max Address EXT	27h
Read Sectors	20h
Read Sectors EXT	24h
Read Verify Sectors	40h
Read Verify Sectors EXT	42h
Security Disable Password	F6h
Security Erase Prepare	F3h
Security Erase Unit	F4h
Security Freeze Lock	F5h
Security Set Password	F1h
Security Unlock	F2h
Seek	70h
SET FEATURES	
Enable write cache	EFh/02h
Disable write cache	EFh/82h
Set transfer mode	EFh/03h

Command	Command Code
Enable Power-Up In Standby	Efh/06h
Disable Power-Up In Standby	Efh/86h
Enable DMA Setup FIS Auto-Activate optimization	Efh/10h/02h
Disable DMA Setup FIS Auto-Activate optimization	Efh/90h/02h
Enable Device-initiated interface power state transitions	Efh/10h/03h
Disable Device-initiated interface power state transitions	Efh/90h/03h
SET MAX	
Set Max Address	F9h/na
Set Max Freeze Lock	F9h/04h
Set Max Lock	F9h/02h
Set Max Set Password	F9h/01h
Set Max Unlock	F9h/03h
Set Max Address EXT	37h
Set Multiple Mode	C6h
Sleep	E6h or 99h
SMART	
SMART Disable Operations	B0h/D9h
SMART Enable Operations	B0h/D8h
SMART Enable/Disable attribute Autosave	B0h/D2h
SMART Execute OFF-Line Immediate	B0h/D4h
SMART Read Attribute Thresholds	B0h/D1h
SMART Read Data	B0h/D0h
SMART Read Log	B0h/D5h
SMART Return Status	B0h/DAh
SMART Save Attribute Values	B0h/D3h
SMART Write Log	B0h/D6h
Standby	E2h or 96h
Standby Immediate	E0h or 94h
Soft Reset	FFh
Write Buffer	E8h
Write DMA	CAh
Write DMA EXT	35h
Write FPDMA Queued	61h
Write Log Ext	3Fh
Write Multiple	C5h
Write Multiple Ext	39h
Write Sectors	30h
Write Sectors Ext	34h

8. SMART Feature Set

Renice X7 supports the SMART command set and defines some vendor-specific data to report spare/bad block numbers in each memory management unit.

Table 6: SMART Feature Register Values

Command Name	Command Code
SMART READ DATA	D0h
SMART Read Attribute Threshold	D1h
SMART ENABLE/DISABLE ATTRIBUTE AUTOSAVE	D2h
SMART EXECUTE OFF-LINE IMMEDIATE	D4h
SMART READ LOG	D5h
SMART WRITE LOG	D6h
SMART ENABLE OPERATIONS	D8h
SMART DISABLE OPERATIONS	D9h
SMART RETURN STATUS	DAh

8.1 SMART Data Structure

The following 512bytes make up the device SMART data structure. Users can obtain the data using the "Read Data" command (D0h).

Table 7: SMART Data Structure

Byte	Description
0~1	Data structure revision number (Vendor Specific)
2~361	1st - 30th Individual attribute data (Vendor Specific)
362	Off-line data collection status
363	Self-test execution status
364~365	Total time in seconds to complete off-line data collection activity
366	Vendor Specific
367	Off-line data collection capability
368-369	SMART capability

Byte	Description
370	Error logging capability 7-1 Reserved 0 1=Device error logging supported
371	Self-test failure check point (Vendor Specific)
372	Short self-test routine recommended polling time(in minutes)
373	Extended self-test routine recommended polling time(in minutes)
374-510	Reserved
511	Data structure checksum

8.2 SMART Attributes

The following table defines the vendor specific data in byte 2 to 361 of the 512byte SMART data.

Table 8: SMART Data Vendor-specific Attributes

ID(DEC)	ID(HEX)	Attribute Name	Description
1	01h	Vendor-specific	
9	09h	Power-On Hours	The time amount of power-on state (unit: hours)
12	0Ch	Power Cycle Count	Counts of full power on/off cycles
13	0Dh	Vendor-specific	
181	AFh	Program Failure Block Count	Counts the number of flash program failures 00~23 : flash program failure count / 24~47 : flash erase failure count
184	B8h	Initial Bad Block Count	The number of bad blocks which was detected when firmware was installed
187	BBh	Read Failure Block Count (Uncorrectable)	Uncorrectable read failure block count 00~23 : read bad block count / 24~47 : potential read bad block count
190	BEh	Temperature	Current device temperature (unit: °C)
199	C7h	SATA Error CRC Count	The number of encountered SATA interface errors 00~23 : CRC Error count / 24~47 : Handshake Error Count
200	C8h	Total count of write commands	The total number of written command during the entire lifetime of the device
201	C9h	Total count of read commands	The total number of read command during the entire lifetime of the device
202	CAh	Vendor-specific	
204	CCh	Vendor-specific	
209	D1h	SSD Life Left (Remaining Drive Life)	Indicates the approximate SSD life left [(maximum PE cycle – average erase count) / maximum PE cycle]

ID(DEC)	ID(HEX)	Attribute Name	Description
210	D2h	Erase Count	Indicates the minimum, average, maximum erased counts of all the blocks 00~15 : The minimum erased count 16~31 : The average erased count 32~47 : The maximum erased count
213	D5h	Maximum PE Cycle Count	Returns maximum PE cycle counts of flash
225	E1h	Vendor-specific	
226	E2h	Flush command count	Flush command count 00~23: self flush count / 24~47: host flush count
227	E3h	Vendor-specific	
228	E4h	Vendor-specific	
229	E5h	Vendor-specific	
230	E6h	Total Free Block	The current total free blocks count
241	F1h	Vendor-specific	

9. Ordering Information

Table 9: Valid Combinations

Capacities/ Flash Type	Industrial Temp
1TB/MLC	RIM01T-SX72
2TB/MLC	RIM02T-SX72
4TB/MLC	RIM04T-SX72
8TB/MLC	RIM08T-SX72

10. Part Number Naming Rule

