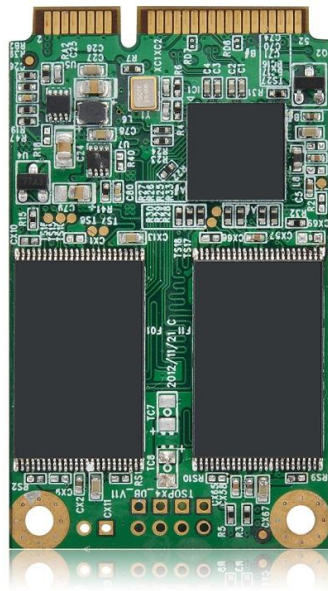


ShenZhen Renice Technology Co., Ltd

# X5D mSATA SSD

Datasheet





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# 1. Introduction

## 1.1 Product Overview

X5D mSATA series conforms to the JEDEC MO-300 standard and supports Wide Operating Temperature, Power Failure Protection. Its excellent stability and durability could meet the request of embedded equipment in harsh operating environment.

## 1.2 Feature

- **Standard Serial ATA:** SATA III, 6.0Gbps (Backward compatible with SATA 1.5 and 3.0Gbps)
- **Form factor:** mSATA 50.95mm X 30mm X 3.65mm (L x W x H)
- **Connector:** 52pin SATA-based MSATA pin out
- **Performance:**
  - Max Sequential Data Read/Write: 560MB/500MB/s
  - 4Kb Random Read/Write IOPS: 70,000 / 75,000
  - Access Time: <0.1ms
- **Capacities:** 64GB, 128GB, 256GB (pSLC)
- **Power Management:**
  - Input voltage: 3.3V (±5%)
  - Support Hot Plug/Removal Function
- **Temperature ranges:**
  - Operation: -40 to 85°C
  - 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)
  - Support BCH ECC 66bits in 1KBytes
  - Support Write protection (P11)
  - Support Power Failure Protection
  - Support over Voltage Protection
  - Support Security Function (option)
  - Support AES 256bit encryption (option)
  - Support TRIM
  - Support NCQ
  - Support Devslp
- **MTBF:** 3,000,000 Hours @25C



### 1.3 Drive Capacity

	64GB pSLC	128GB pSLC	256GB pSLC	512GB pSLC
User-Addressable Sectors	250,069,680	500,118,192	1,000,215,216	2,000,409,264
Byte per Sector	512 Byte			

### 1.4 System Performance

Read / Write	64GB pSLC	128GB pSLC	256GB pSLC	512GB pSLC
Sequential Read	560MB/s	560MB/s	560MB/s	560MB/s
Sequential Write	500MB/s	400MB/s	500MB/s	500MB/s

#### Random Read / Write Performance

Read / Write	64GB pSLC	128GB pSLC	256GB pSLC	512GB pSLC
Random Read IOPS	40K	45K	50K	50K
Random Write IOPS	75K	80K	80K	80K



### 1.5 Supply Voltage

Item	Requirements
Allowable voltage	3.3V±5%
Allowable noise / ripple	100 mV p-p or less

### 1.6 System Power Consumption

Read / Write	64GB pSLC	128GB pSLC	256GB pSLC	512GB pSLC
Active Write (Max.) <sup>1)</sup>	0.8W	1.0W	1.3W	TBDW
Active Read (Max.) <sup>1)</sup>	1.0W	1.1W	1.4W	TBDW
Idle	0.2W	0.2W	0.3W	TBDW
DEVSLP	5mW			

## 2. Functional Block Diagram

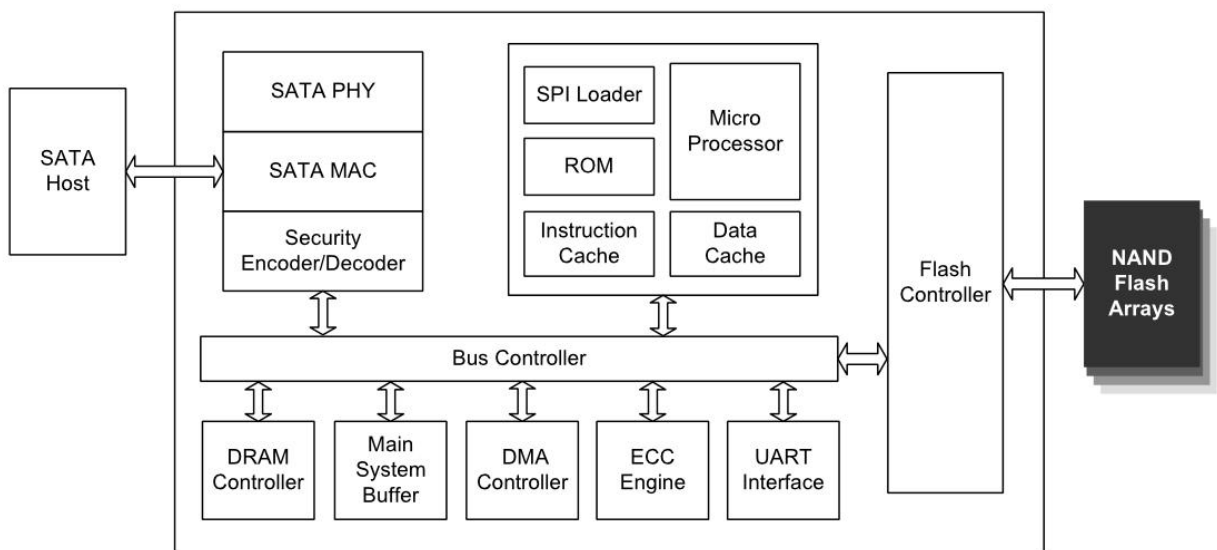


Figure 1: Renice X5D mSATA SATAIII SSD Block Diagram



# 3. Product Specifications

## 3.1 Physical Specifications

Table 1: Physical Specifications

<b>Form Factor</b>	MSATA	
<b>Dimensions</b>	Length	50.95±0.25mm
	Width	30±0.25mm
	Height	3.65±0.25mm
<b>Weight</b>	<30g	
<b>Connector</b>	52 pin	

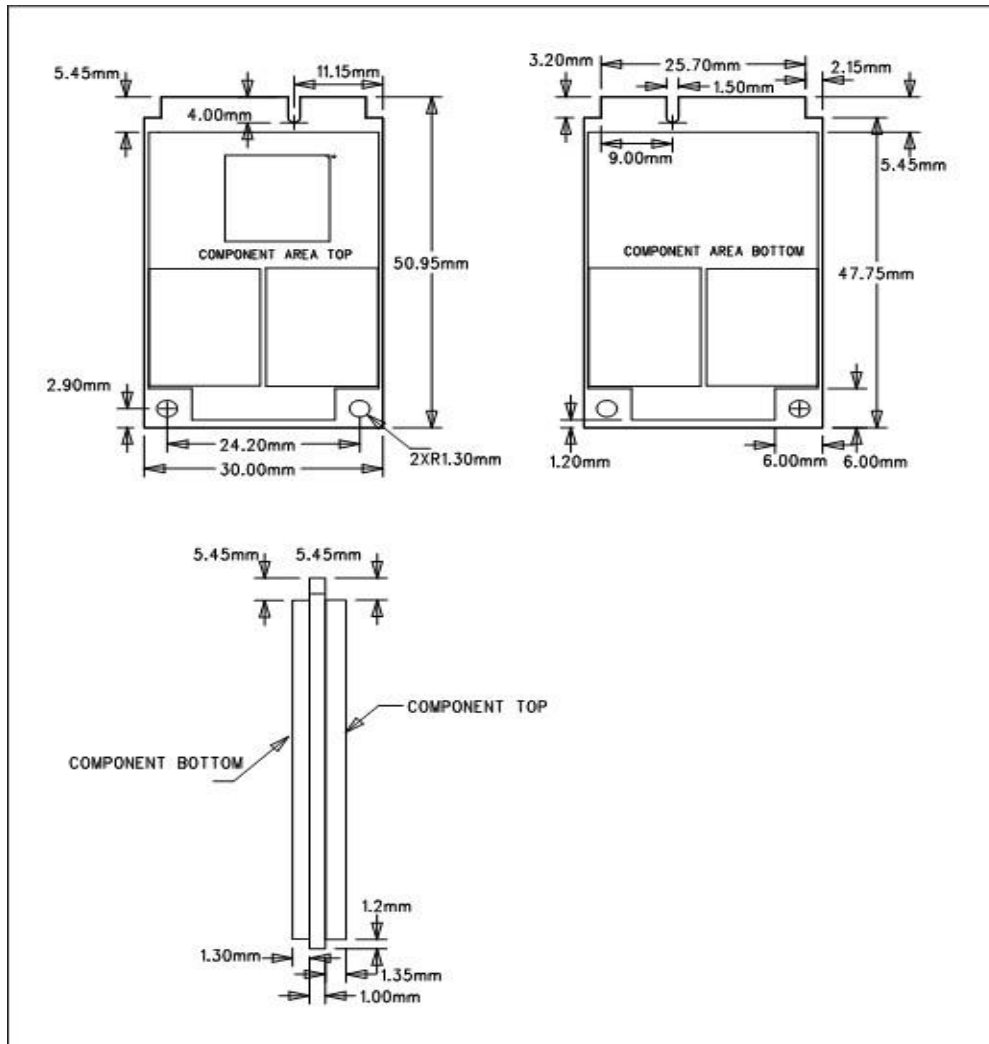


Figure 2: Renice X5D mSATA SATAIII SSD mechanical dimensions

## 3.2 Host Interface

Industrial Standard SATA Revision 3.1 compliant

Industrial Standard ATA/ATAPI-8 ACS-2 command compliant

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

Native Command Queuing (NCQ): up to 32 commands

S.M.A.R.T. command transport (SCT) technology

SATA Device Sleep (DevSlp)

Data Set Management command (TRIM)

Supports 28bit and 48bit LBA mode commands

Table 2: Capacity Specification

## 4. Interface Description

### 4.1 Pin Assignment

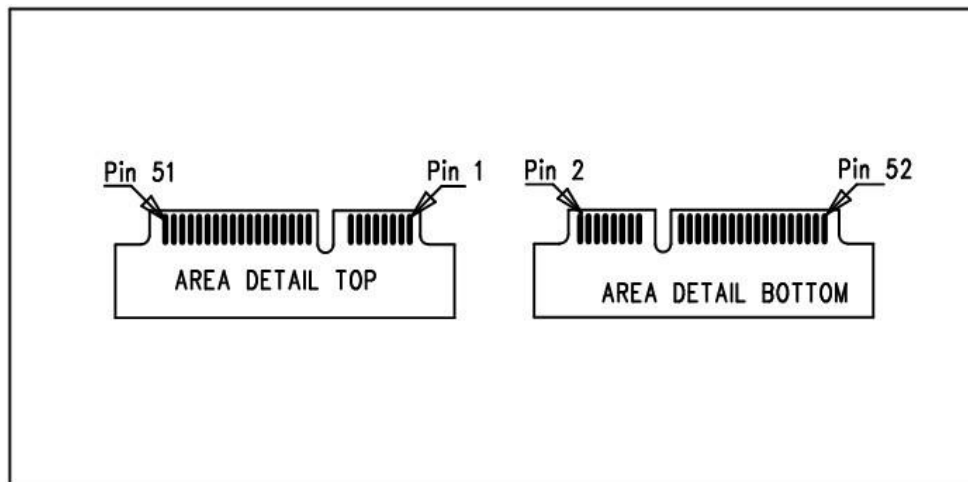


Figure 3: Pin Assignments



## 4.2 Pin Description

**Table 3: Pin Assignments**

Pin	Definitions	Pin	Definitions
P1	NC	P2	+3.3V
P3	NC	P4	GND
P5	NC	P6	NC
P7	NC	P8	NC
P9	GND	P10	NC
P11	NC	P12	NC
P13	NC	P14	NC
P15	GND	P16	NC
P17	NC	P18	GND
P19	NC	P20	NC
P21	GND	P22	NC
P23	SATA Differential TX+ based on SSD	P24	+3.3V
P25	SATA Differential TX- based on SSD	P26	GND
P27	GND	P28	NC
P29	GND	P30	NC
P31	SATA Differential RX- based on SSD	P32	NC
P33	SATA Differential RX+ based on SSD	P34	GND
P35	GND	P36	NC
P37	GND	P38	NC
P39	+3.3V	P40	GND
P41	+3.3V	P42	NC
P43	GND	P44	DevSlp
P45	Vendor	P46	NC
P47	Vendor	P48	NC
P49	DAS/DSS	P50	GND
P51	Presence Detection	P52	+3.3V





## 5. Power Specifications

### 5.1 Operating Voltage

Operating voltage: 3.3V (±5%)

### 5.2 Power Supply Voltage

1.2V for Core, 1.5V for DDR, 3.3V for NAND and 1.8V for NAND IO

### 5.3 Power Consumption (typical)

Active: 0.85W (64GB), 0.9W (128GB), 0.95W (256GB)

Idle: 0.2W

## 6. Reliability Specification

### 6.1 Environment

**Table 4: 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 Power Failure Protection

Renice X5D mSATA SSD adopts Voltage Detector Circuit to detect current voltage status, when current voltage is detected abnormal, the power failure protection function of X5D mSATA SSD will work to prevent data crash or drive corruption in case of sudden power failure.



## 6.3 Endurance

Write endurance: >12 years @ 100GB write/ day (256GB MLC)

Read endurance: unlimited

# 7. Supported ATA Command Lists

**Table 5: Support ATA Command Lists**

Support ATA/ATAPI Command	Code	Subcode / Page
NOP	00h	
Data Set Management	06h	
Trim		01h
Recalibrate	1Xh	
Read Sectors	20h	
Read Sectors (w/o retry)	21h	
Read Sectors Ext	24h	
Read DMA Ext	25h	
Read Native Max Address Ext	27h	
Read Multiple Ext	29h	
Read Log Ext	2Fh	
Log Directory		00h
Extended Comprehensive SMART Error Log		03h
Device Statistics Logs		04h
<i>List of supported log pages</i>		00h



<i>General Statistics</i>		01h
<i>General Errors Statistics</i>		04h
<i>Transport Statistics</i>		06h
<i>SSD Statistics</i>		07h
Extended SMART Self-test Log		07h
NCQ Error Log		10h
SATA Phy Event Counters Log		11h
Identify Device Data Log		30h
<i>List of Supported Pages</i>		00h
<i>Copy of IDENTIFY DEVICE Data</i>		01h
		02h
<i>Supported Capabilities</i>		03h
<i>Current Settings</i>		04h
<i>ATA Strings</i>		05h
Write Sectors	30h	
Write Sectors Ext	34h	

Write DMA Ext	35h	
Set Max Address Ext	37h	
Write Multiple Ext	39h	
Write DMA FUA Ext	3Dh	
Write Log Ext	3Fh	



Selective Self-Test log(SMART)		09h
Host Specific(SMART)		80h~9Fh
SCT Command/Status(SCT)		E0h
SCT Data Transfer(SCT)		E1h
Read Verify Sectors	40h	
Read Verify Sectors (w/oretry)	41h	
Read Verify Sectors Ext	42h	
Write Uncorrectable Ext	45h	
Pseudo-UECC with logging		55h
Read FPDMA Queued	60h	
Write FPDMA Queued	61h	
Seek	7Xh	
Execute Device Diagnostic	90h	
Initialize Drive Parameters	91h	
Download Microcode	92h	
Download with offsets and save microcode for immediate and future use.		03h
Download (without offsets) and save microcode		07h
Download with offsets and save microcode for future use / Activate downloaded microcode		0Eh/0Fh
SMART	B0h	
Read Data		D0h
Read Thresholds		D1h
Enable/Disable Attr Autosave		D2h
Exec Off-line Immediate		D4h
<i>Execute Off-Line routine</i>		00h
<i>Execute Short Self-test routine (Off-Line)</i>		01h
<i>Execute Extended Self-test routine (Off-Line)</i>		02h
<i>Abort Off-Line Self-test routine</i>		7Fh
<i>Execute Short Self-test routine (Captive)</i>		81h



<i>Execute Extended Self-test routine (Captive)</i>		82h
Read Log Sector		D5h
Write Log Sector		D6h
Enable Operations		D8h
Disable Operations		D9h
Return Status		Dah
<u>Sanitize Device</u>	<u>B4h</u>	
<u>Sanitize Status Ext</u>		<u>00h</u>
<u>Block Erase Ext</u>		<u>12h</u>
<u>Sanitize Freeze Lock Ext</u>		<u>20h</u>
Read Multiple	C4h	
Write Multiple	C5h	
Set Multiple Mode	C6h	
Read DMA	C8h	
Read DMA (w/oretry)	C9h	
Write DMA	CAh	
Write DMA (w/o retry)	CBh	
Write Multiple FUA Ext	CEh	
Standby Immediate	E0h	
Idle Immediate	E1h	
Standby	E2h	
Idle	E3h	
Read Buffer	E4h	
Check Power Mode	E5h	
Sleep	E6h	
Flush Cache	E7h	
Write Buffer	E8h	
Flush Cache Ext	EAh	
Identify Device	ECh	



Set Features	EFh	
Security Set Password	F1h	
Security Unlock	F2h	
Security Erase Prepare	F3h	
Security Erase Unit	F4h	
Security Freeze Lock	F5h	
Security Disable Password	F6h	
Read Native Max Address	F8h	
Set Max Address	F9h	
Set Max Set Password		01h
Set Max Lock		02h
Set Max Unlock		03h
Set Max Freeze Lock		04h
Set Max Set Password DMA		05h
Set Max Unlock DMA		06h

## 8. SMART Feature Set

The Renice X5D supports the SMART command set and defines some vendor-specific data to report spare/bad block numbers in each memory management unit.

### 8.1 SMART Data Structure

**Table 7: SMART Data Structure**

BYTE	F / V	Description
0-1	X	Revision code
2-361	X	Vendor specific
362	V	Off-linedata collection status



363	X	Self-test execution status byte
364-365	V	Total time in seconds to complete off-linedata collection activity
366	X	Vendor specific
367	F	Off-linedata collection capability
368-369	F	SMART capability
370	F	Error logging capability 7-1 Reserved 0 1=Device error logging supported
371	X	Vendor specific
372	F	Short self-test routine recommended polling time (in minutes)
373	F	Extended self-test routine recommended polling time (in minutes)
374	F	Conveyance self-test routine recommended polling time (in minutes)
375-385	R	Reserved
386-395	F	Firmware Version/Date Code
396-399	F	Reserved
400-409	V	SMI2258TLC
410-510	X	Vendor specific
511	V	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**



Attribute ID (hex)	Raw Attribute Value							Attribute Name
	MSB	00	00	00	00	00	00	
01	MSB	00	00	00	00	00	00	Read error rate
05	LSB	MSB	00	00	00	00	00	Reallocated sectors count
09	LSB			MSB	00	00	00	Power-on hours
0C	LSB			MSB	00	00	00	Power cycle count
A0	LSB			MSB	00	00	00	Uncorrectable sector count when read/write
A1	LSB	MSB	00	00	00	00	00	Number of valid spare block
A3	LSB	MSB	00	00	00	00	00	Number of initial invalid block
A4	LSB			MSB	00	00	00	Total erase count
A5	LSB			MSB	00	00	00	Maximum erase count
A6	LSB			MSB	00	00	00	Minimum erase count
A7	LSB			MSB	00	00	00	Average erase count
A8	LSB			MSB	00	00	00	Max erase count of spec
A9	LSB			MSB	00	00	00	Remain Life (percentage)
AF	LSB			MSB	00	00	00	Program fail count in worst die
B0	LSB	MSB	00	00	00	00	00	Erase fail count in worst die
B1	LSB			MSB	00	00	00	Total wearlevel count
B2	LSB	MSB	00	00	00	00	00	Runtime invalid block count
B5	LSB			MSB	00	00	00	Total program fail count
B6	LSB	MSB	00	00	00	00	00	Total erase fail count
BB	LSB			MSB	00	00	00	Uncorrectable error count
C0	LSB	MSB	00	00	00	00	00	Power-off retract count
C2	MSB	00	00	00	00	00	00	Controlled temperature
C3	LSB			MSB	00	00	00	Hardware ECC recovered
C4	LSB			MSB	00	00	00	Reallocation event count
C6	LSB			MSB	00	00	00	Uncorrectable error count off-line
C7	LSB	MSB	00	00	00	00	00	UltraDMA CRC error count
E1	LSB						MSB	Total LBAs written (each write unit = 32MB)
E8	LSB	MSB	00	00	00	00	00	Available reserved space
F1	LSB						MSB	Total LBAs written (each write unit = 32MB)
F2	LSB						MSB	Total LBAs read (each read unit = 32MB)





## 9. Ordering Information

**Table 9: Valid Combinations**

Part Number	Description
RIP064-SX5DM	X5D MSATA SATAIII 64GB pSLC Industrial SSD
RIP128-SX5DM	X5D MSATA SATAIII 128GB pSLC Industrial SSD
RIP256-SX5DM	X5D MSATA SATAIII 256GB pSLC Industrial SSD
RIP512-SX5DM	X5D MSATA SATAIII 512GB pSLC Industrial SSD