ShenZhen Renice Technology Co., Ltd

X10 2.5" U.2 NVMe R-SLC SSD

Datasheet

V1.0

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CATALOGUE

1. Introduction

1.1 Product Overview

The Renice PCIe U.2 X10 Series Industrial SSD (referred to as 2.5” U.2 R-SLC SSD in this datasheet) is high-performance, high reliability solid state drive, built with NAND Flash memory, DRAM memory, and the advanced PCIe NVMe controller in a standard 2.5-inch form factor housing.

2.5” U.2 R-SLC SSD is using 1-bit-per-cell (SLC) NAND configuration, making it well-suited for write-intensive applications used in wide temperature (-40°C ~+85°C) and high stress environments, such as rail transportation, aerospace, marine and industrial applications.

Comblied with roubust NAND ECC, advanced wear-leveling algorithms and bad block management, 2.5” U.2 R-SLC SSD technology helps the data rebuild when die retired or failed. Thereby improved data reliability and significantly extend lifetime of the disk.

1.2 Feature

- **Industry Standard PCIe Interface:** PCIe 3.0x4 (Compatible with NVMe Express 1.2)
- **Form factor:** 2.5-inch 100.45mm x 69.85mm x 9.5mm (L x W x H)
- **Performance:**
  - Max Sequential Data Read/Write: 2600MB/1900MB/s
  - 4Kb Random Read/Write IOPS: 600,000 / 160,000
  - Latency: Sequential Read/Write: 50μs/20μs (typical)
    Random Read/Write: 105μs/20μs (typical)
- **Capacities:** 960GB, 1.92TB
- **Lifetime Endurance:** 30 Drive Writes Per Day (DWPD) for 5 years
- **Data Retention:** 10 years/ 1year (JESD218B.01)
- **Data Security:**
  - AES 256-bit Encryption
  - End-to-End data path protection
  - Secure Erase (data sanitization)
- **NAND Configuration: 1 bit per cell (Real-SLC)**
- **Advanced NVMe features:**
  - 512B/4KB sector supported
  - TRIM support
  - Support SMART command
- **Power Management:**
  - Input voltage: 12V (±10%)
  - Active mode: 10W

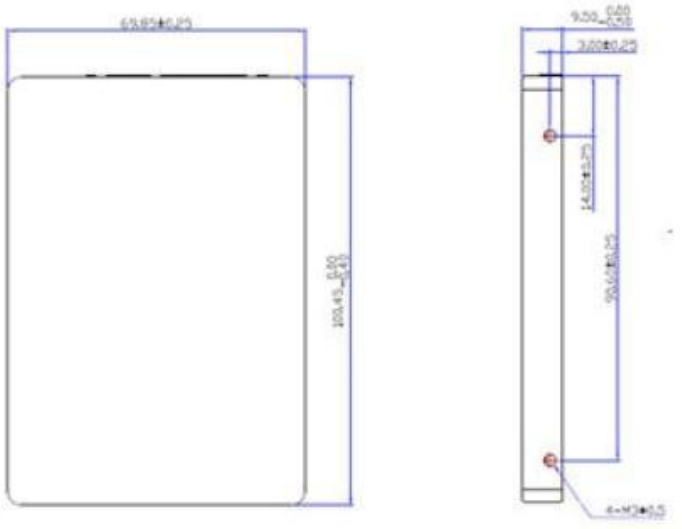
● **Temperature ranges:**
– Operation: -40 to +85°C (Industrial)
– Storage: -50 to +90°C
● **Intelligent features:**
- Built-in ECC
- End-to-End data protection (local CRC)
- AES 256-bit encryption
- Unrecoverable Bit Error Rate (UBER): <1 sector per 10^{27} bits read
- Static and Dynamics Wear Leveling
- On-Chip Adaptive RAID data rebuild protection
- Read only mode when not enough reserved space
- Support Power Interrupt Data Protection
● **MTBF:** >2,000,000 Hours @25C

2. Product Specifications

2.1 Physical Specifications

Table 1: Physical Specifications

Form Factor		2.5 INCH
Dimensions	Length	100.45±0.25mm
	Width	69.85±0.25mm
	Height	9.5±0.25mm
Weight		<100g
Connector		U.2 Interface



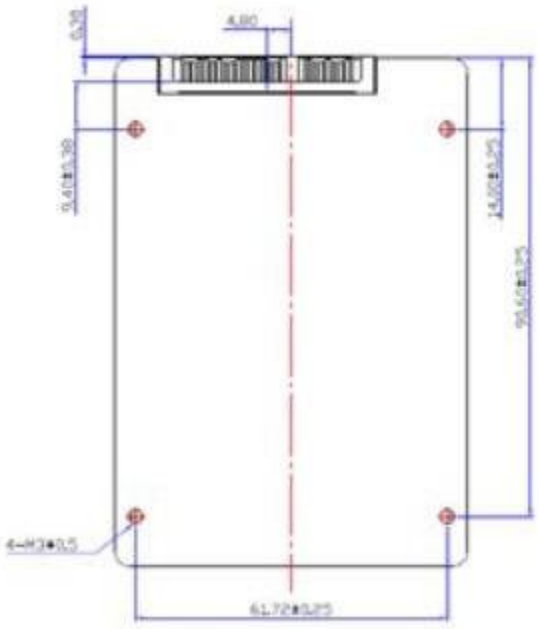


Figure 1: X10 2.5" PCIe NVMe U.2 SSD mechanical dimensions

2.2 Capacity

Table 2: Capacity Specification

Parameter	User Addressable Sector	Bytes per Sector
960GB	1,875,385,008	512 Byte
1.92TB	3,750,748,848	

Table 3: Sequential Read/Write Performance

Capacity	Product	Sequential Read (128KB)	Sequential Write (128KB)
960GB	RIT960-EX10U	1300MB/s	1300MB/s
1.92TB	RIT1920-EX10U	2600MB/s	1900MB/s

Table 4: Substained Random Read/Write Performance

Capacity	Product	4KB Random Read/Write (IOPS)	8KB Random Read/Write (IOPS)
960GB	RIT960-EX10U	300K/30K	150K/15K
1.92TB	RIT1920-EX10U	600K/55K	300K/28K

3. Interface Description

3.1 Pin Assignments

Table 5: Signal and Power Segment

Pin No.	Pin Name	Description
S1	GND	Ground
S2	S0T+ (A+)	SAS/SATA/SATAe 0 Tx+
S3	S0T- (A-)	SAS/SATA/SATAe 0 Tx -
S4	GND	Ground
S5	S0R- (B-)	SAS/SATA/SATAe 0 Rcv -
S6	S0R+ (B+)	SAS/SATA/SATAe 0 Rcv +
S7	GND	Ground
E1	RefClk1+	ePCIe RefClk + (port B)
E2	RefClk1-	ePCIe RefClk – (port B)
E3	3.3Vaux	3.3V for SM bus
E4	ePERst1#	ePCIe Reset (port B)
E5	ePERst0#	ePCIe Reset (port A)
E6	RSVD(Vendor)	Reserved (vendor)
P1	RSVD(Wake#)	Reserved(WAKE#/OBFF)
P2	sPCIeRst	SATAe Client
P3	RSVD(DevSLP)	Reserved(ClkReq#/DevSLP)
P4	IfDet#	Interface Detect (Was GND-precharge)
P5	GND	Ground
P6	GND	Ground
P7	5 V	5V pre-charge
P8	5 V	5V
P9	5 V	5V
P10	PRSNT#	Presence (Drive type)
P11	Activity	Activity(output)/Spinup
P12	GND	Hot Plug Ground
P13	12 V	12V pre-charge

P14	12 V	12V
P15	12 V	12V
E7	RefClk0+	ePCIe Primary RefClk +
E8	RefClk0-	ePCIe Primary RefClk -
E9	GND	Ground
E10	PETp0	ePCIe 0 Transmit +
E11	PETn0	ePCIe 0 Transmit -
E12	GND	Ground
E13	PERn0	ePCIe 0 Receive -
E14	PERp0	ePCIe 0 Receive +
E15	GND	Ground
E16	RSVD	Reserved
S8	GND	Ground
S9	S1T+	SAS/SATAe 1 Transmit +
S10	S1T-	SAS/SATAe 1 Transmit -
S11	GND	Ground
S12	S1R-	SAS/SATAe 1 Receive -
S13	S1R+	SAS/SATAe 1 Receive +
S14	GND	Ground
S15	RSVD	Reserved
S16	GND	Ground
S17	PETp1/S2T+	ePCIe 1 /SAS 2 Transmit +
S18	PETn1/S2T-	ePCIe 1 /SAS 2 Transmit -
S19	GND	Ground
S20	PERn1/S2R-	ePCIe 1 /SAS 2 Receive -
S21	PERp1/S2R+	ePCIe 1 /SAS 2 Receive +
S22	GND	Ground
S23	PETp2/S3T+	ePCIe2 / SAS 3 Transmit +
S24	PETn2/S3T-	ePCIe2 / SAS 3 Transmit -
S25	GND	Ground
S26	PERn2/S3R-	ePCIe 2 / SAS 3 Receive -
S27	PERp2/S3R+	ePCIe 2 / SAS 3 Receive +
S28	GND	Ground
E17	PETp3	ePCIe 3 Transmit +
E18	PETn3	ePCIe 3 Transmit -
E19	GND	Ground
E20	PERn3	ePCIe 3 Receive -
E21	PERp3	ePCIe 3 Receive +
E22	GND	Ground
E23	SMClk	SM-Bus Clock
E24	SMDat	SM-Bus Data
E25	DualPortEn#	ePCIe 2x2 Select

4. Power Specifications

4.1 Operating Voltage

Operating voltage: 12V (±10%)

4.2 Power Consumption (typical)

Table 6: Power Consumption

Capacity	Part Number	Active Write (Typ)	Active Read (Typ)	Idle
960GB	RIT960- EX10U	7W	6W	3.5W
1.92TB	RIT1920- EX10U	10W	8.5W	4W

5. Reliability Specification

5.1 Environment

Table 7: Environmental Specifications

Item	Features	
Temperature	Operation	-40°C ~+85°C
	Storage	-50°C ~+110°C
Humidity	5-95%	
Vibration	10Hz-2000Hz, 20 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)	

5.2 Power Failure Data Protection

X10 2.5” U.2 PCIe SSD adopts onboard circuit mechanism to ensure data integrity during abnormal power failure. When current voltage is detected abnormal, the controller will send a command to the host only when the incoming data is fully committed to the NAND Flash.

5.3 Advanced Data Security

X10 2.5” U.2 NVMe R-SLC SSD supports AES-256bit encryption to protect the user data information. Meanwhile, it compliant NVMe standard protocol to implement secure erase via two methods: (1) Crypto Erase to delete OPAL based encrypt key and data quickly; (2) Erase block via sanitize command.

6. Supported Commands

Table 8: Device Identification

Capacity	*1 (Word 1/ Word 54)	*2 (Word57-58)	*3 (Word 60-61)	*4 (Word 100-103)
960GB	3FFFh	FBFC10h	FFFFFFFh	6FC81AB0
1.92TB	3FFFh	FBFC10h	FFFFFFFh	1BF1F72B0

6.1 Command Description

2.5” U.2 NEMe R-SLC SSD supports the following command set compliant with NVMe specification.

Table 9: Command sets

Command Type	Command	Opcode
Admin Commands Set	Delete I/O Submission Queue	00h
	Create I/O Submission Queue	01h
	Get Log Page	02h
	Delete I/O Completion Queue	04h
	Create I/O Completion Queue	05h
	Identify	06h
	Abort	08h
	Set Feature	09h
	Get Feature	0Ah
	Asynchronous Event Request	0Ch
	Firmware Commit	10h
	Firmware Image Download	11h
NVM Commends Set	Flush	00h
	Write	01h
	Read	02h
	Dataset Mansgement	09h

6.1.1 NVMe Identify Data Structure

Table 10: NVMe Identiy Namespace Data Structure

Item	Value	Comment
nsze	0x5d26ceb0	
ncap	0x5d26ceb0	
nuse	0x5d26ceb0	
nsfeat	0	
[2:2]	0	Deallocated or Unwritten Logical Block error Not Supported
[1:1]	0	Namespace uses AWUN, AWUPF, and ACWU
[0:0]	0	Thin Provisioning Not Supported
nlbaf	1	
flbas	0	
[4:4]	0	Metadata Transferred in Separate Contiguous Buffer
[3:0]	0	Current LBA Format Selected
mc	0	
[1:1]	0	Metadata Pointer Not Supported
[0:0]	0	Metadata as Part of Extended Data LBA Not Supported
dpc	0	
[4:4]	0	Protection Information Transferred as Last 8 Bytes of Metadata Not Supported
[3:3]	0	Protection Information Transferred as First 8 Bytes of Metadata Not Supported
[2:2]	0	Protection Information Type 3 Not Supported
[1:1]	0	Protection Information Type 2 Not Supported
[0:0]	0	Protection Information Type 1 Not Supported
dps	0	
[3:3]	0	Protection Information is Transferred as Last 8 Bytes of Metadata
[2:0]	0	Protection Information Disabled
nmic	0	
[0:0]	0	Namespace Multipath Not Capable
rescap	0	
[6:6]	0	Exclusive Access - All Registrants Not Supported

[5:5]	0	Write Exclusive - All Registrants Not Supported
[4:4]	0	Exclusive Access - Registrants Only Not Supported
[3:3]	0	Write Exclusive - Registrants Only Not Supported
[2:2]	0	Exclusive Access Not Supported
[1:1]	0	Write Exclusive Not Supported
[0:0]	0	Persist Through Power Loss Not Supported
fpi	0	
[7:7]	0	Format Progress Indicator Not Supported
nawun	0	
nawupf	0	
nacwu	0	
nabsn	0	
nabo	0	
nabspf	0	
noiob	0	
nvmcap	0	
nguid	0	
eui64	0	
LBA Format 0	Metadata Size: 0 bytes - Data Size: 512 bytes - Relative Performance: 0x3 Degraded (in use)	
LBA Format 1	Metadata Size: 0 bytes - Data Size: 4096 bytes - Relative Performance: 0 Best	

Table 11: NVMe Identify Controller Data Structure

Item	**Values**
vid	0x1bf5
ssvid	0x1bf5
sn	Serial Number ASICS code
mn	Model Number ASIC code
fr	firmware version ASICS code
rab	16
ieee	0
cmic	0
mdts	8

cntlid	0
ver	10200
rtd3r	7a120
rtd3e	186a0
oaes	0
ctratt	0
oacs	0x6
acl	0
aerl	3
frmw	0x5
lpa	0
elpe	7
npss	0
avscc	0x1
apsta	0
wctemp	378
cctemp	388
mtfa	0
hmpre	0
hmmin	0
tnvmcap	0
unvmcap	0
rpmbs	0
edstt	0
dsto	0
fwug	0
kas	0
hctma	0
mntmt	0
mxtmt	0
sanicap	0
hmminds	0
hmmaxd	0
sqes	0x66
cqes	0x44
maxcmd	0
nn	1
oncs	0x14
fuses	0
fna	0x7

vwc	0x1
awun	0
awupf	0
nvscc	1
acwu	0
sgls	0
subnqn	
ioccsz	0
iorcsz	0
icdoff	0
ctrattr	0
msdbd	0
ps 0	mp:25.00W operational enlat:0 exlat:0 rrt:0 rrl:0
	rwt:0 rwl:0 idle_power:- active_power:-

7. Ordering Information

Table 12: Valid Combinations

Part Number	Description
RIT960- EX10U	960GB X10 2.5” U.2 NVMe R-SLC SSD, Industrial Temp. -40°C to +85°C
RIT1920- EX10U	1920GB X10 2.5” U.2 NVMe R-SLC SSD, Industrial Temp. -40°C to +85°C

7.1 Part Number Naming Rule