

SDK Embedded Systems
RC Series
2.5" SATA SLC SSD
Military Grade with Ruggedized
SATA Connector

2015-1-15

- Available in 2.5 inch SATA-III Form Factor
- Capacity: 32, 64, 128, 256, 512GB
- SLC(Single Level Cell) Nand Flash
- Max Read/Write Sustained Speed is 450/450 MBps
- Max Read/Write IOPS is 90000/90000
- Compatibility
 - Intel Matrix Storage Manager
 - Compatible with SATA-I(1.5Gbps), SATA-II(3.0Gbps) and SATA-III(6.0Gbps)
- Support Smart technology
 - Support NCQ
 - Support Windows Trim command
 - Support AES256 Encryption
- Lifetime Warranty Based on BWPW(Bytes Written Permit in Warranty)
- Compliance
 - CE Certificate
 - FCC Certificate
 - Rohs
- Power Management
 - 5V SATA supply
 - Support Hot Plug/Removal Function
- Power Consumption
 - Active Max: 3W
 - Idle/Sleep: 0.5W
- Applied Temperature
 - Operating: -40°C to +85°C
 - Non-Operating: -55°C to 95°C
- Reliability
 - MTBF: 8,000,000 Hours
- Size:
 - Length: 100.20mm
 - Width : 69.85mm
 - Height: 9.4mm
- Weight:
 - 95 grams

2.5 inch Military SATA-III SLC SSD

Product Ordering Decoder

Model Number	Capacity
SD-MG25RC128S	128GB SLC NAND
SD-MG25RC256S	256GB SLC NAND
SD-MG25RC512S	512GB SLC NAND

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1. Introduction

1.1 Overview

SDKSys RC Series is designed with Recycling technology to greatly reduce the risk of disk failure. Generally speaking, the instability of Nand flash leads to the failure of SSD, which shortens the lifespan of the SSD. To avoid the SSD failure because of accidental instability of NAND Flash, RC Series can detect the instability will be detected and recovered automatically. On the other hand, RC Series owns the great algorithm which can expand the lifespan of SLC SSD by enhanced ECC algorithm of Nand-Flash. For example, the normal SSD can be written 100,000 times in whole disk while RC Series can be written 120,000 times. Besides, RC Series is also provided with integral power fail protection.

1.2 RC Series Block Diagram

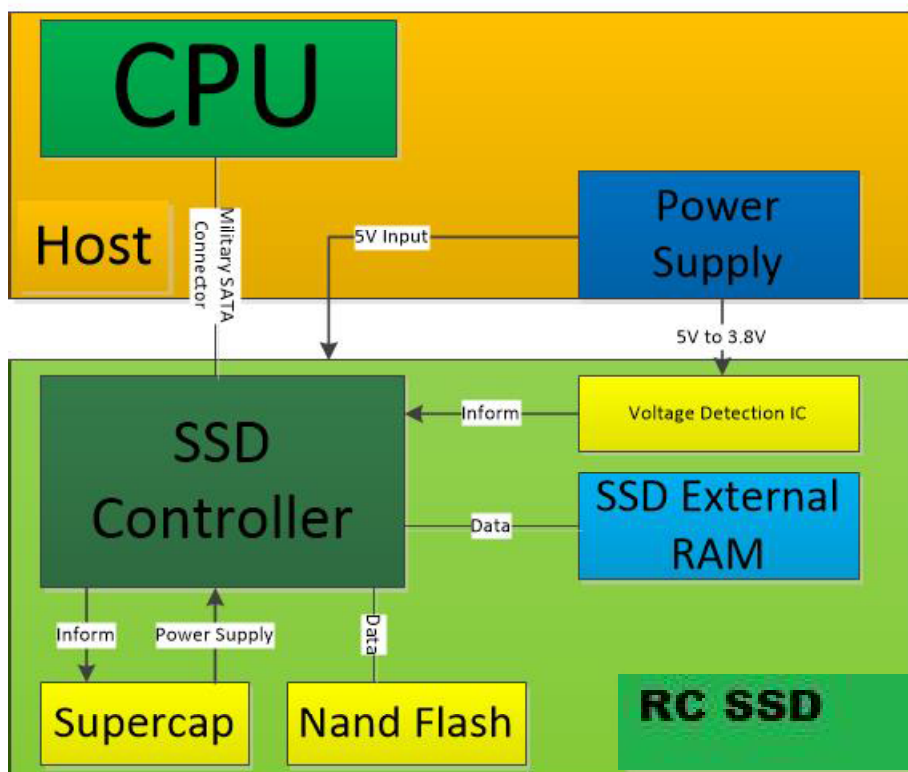


Figure 1. RC Series Block Diagram

1.3 Power-Loss Protection

In order to improve SSD Read/Write performance, Most SSD controllers increase the cache by integrating internal RAM or external RAM expansion. The data will be stored into SSD cache firstly, and then the SSD controller will store this data (SSD cache) into NAND Flash. Thus, if the SSD meet a sudden power loss, once power supply has no any protection mechanism (external power supply met abnormal surge or power-off), the data in the cache will be lost which will result in “Data loss” or “system crash”.

In order to avoid this power loss, we need a mechanism which we call it “Power Fail protection” to prevent the data loss and ensure data integrity. We add 2 kinds of chips to realize “Power Fail protection “ function, one is the voltage detection chip, used to send a interrupt to the SSD controller; the other is the power storage chips, used to provide enough long cruising ability for SSD, if the voltage is detected too low, it will send a interrupt to the SSD controller. At the meantime, the power storage chips will start the power supply. Then the system and user data will be written back to the NAND Flash from DDR. In the whole process, the power storage chips should provide enough power supply and enough long cruising ability, to ensure the SSD controller fully store the data (SSD cache) into the NAND Flash, and fulfill the power-loss protection.

The RC Series is designed with a 3F Capacitor which can support Integral Power Fail Protection under extreme environments and it can support at least 3 seconds Power supply to ensure that all system and user data will be written back to the NAND from DDR.

2. Physical Specification

2.1 RC Series Dimension

Parameters	Values	Units
Length	100.20	MM
Width	69.85	MM
Height	9.40	MM
Weight	95	G

Table1 Physical Dimensions and Weight

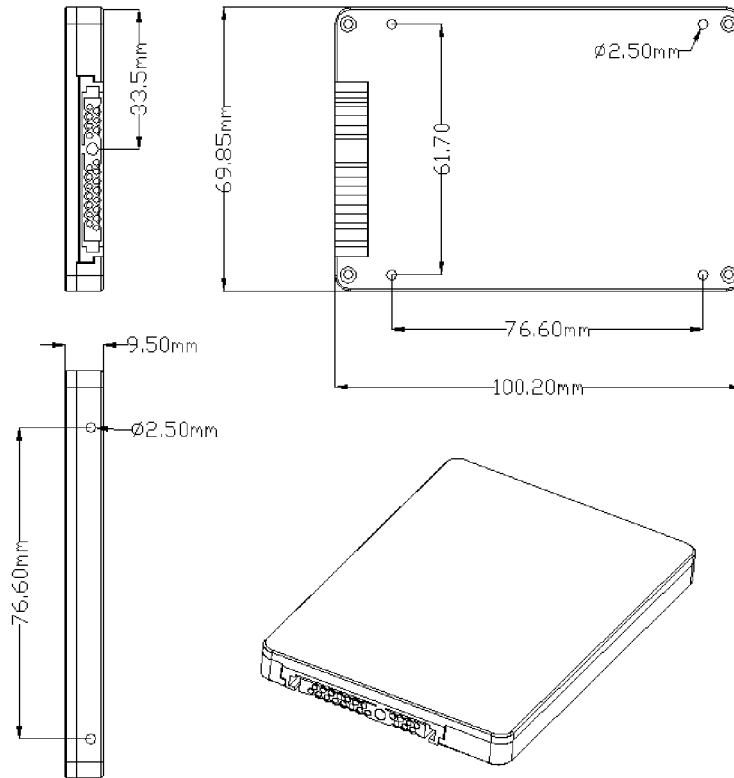


Figure2. RC Series Physical Dimensions

3. Product Specification

3.1 Interface

> The interface of RC Series comply with the standard of SATA-III

> Transfer modes:

- PIO mode 0,1,2,3,4
- DMA mode 0,1,2
- UDMA mode 0,1,2,3,4,5,6

3.2 Capacity

Table 2 Capacity Specification

Capacity	Total Byte	Max LBA
32GB	32,017,047,552	62,533,296
64GB	64,023,257,088	125,045,424
128GB	128,035,676,160	250,069,680
256GB	256,060,514,304	500,118,192
512GB	512,110,190,592	1,000,215,216

4. Performance

4.1 Transfer Rate and IOPS

Table 3 Maximum Transfer rate

Data Transfer	SSD Volume	Max Read	Max Write	Unit
Sustained Rate	32GB	260	230	MB/s
	64GB	450	450	
	128GB	450	450	
	256GB	450	450	
	512GB	450	450	

Notes:

1. Test Environments: Intel I5-3450 CPU Quattro Core, H61 Motherboard, 8GB DDR3, Win8 OS
2. Benchmarking program: CrystalDiskMark

Table 4 Maximum Random IOPS

Data Transfer	SSD Volume	Max Read	Max Write
Random Rate	32GB	45000	45000
	64GB	90000	90000
	128GB	90000	90000
	256GB	90000	90000
	512GB	90000	90000

1. Test Environments: Intel I5-3450 CPU Quattro Core, H61 Motherboard, 8GB DDR3, Win8 OS
2. Benchmarking program: CrystalDiskMark (4K-QD32 Calculation)

5 Electric Specification

5.1 Pin Descriptions

5.1.1 Pin Locations

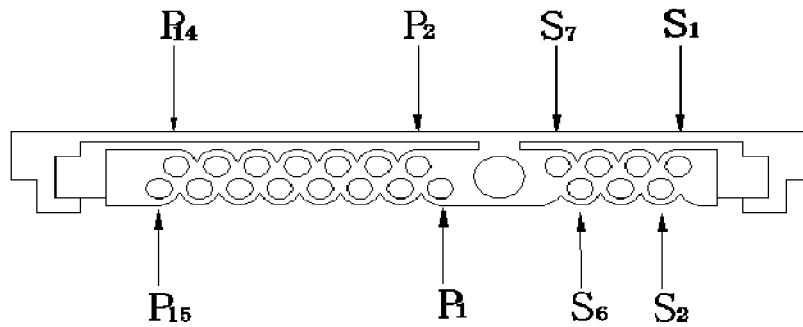


Figure3 Pin Locations

5.1.2 Signal Description Table

Table 6 Signal Connector Pins Definitions

Pin No.	Signal Definitions	Signal Descriptions
S1	GND	2nd mate
S2	A+	Differential signal pair A
S3	A-	
S4	GND	2nd mate
S5	B+	Differential signal pair B
S6	B-	
S7	GND	2nd mate

5.1.3 Power Description Table

Table 7 Power Connector Pins Definitions

Pin No.	Signal Definitions	Signal Descriptions
P1	V33	No Power
P2	V33	
P3	V33	
P4	GND	
P5	GND	
P6	GND	
P7	V5	5V Power
P8	V5	
P9	V5	
P10	GND	
P11	RESERVED	
P12	GND	
P13	V12	No Power
P14	V12	
P15	V12	

5.2 Power Supply Voltage

Table 8 Power Supply Voltage

Parameter	Min	Max	Unit
Operating Voltage	4.75	5.25	V

5.3 Power Consumption

Table 9 Power Consumption

Parameter	SSD Volume	Value	Unit
Active	32GB	2.5	W
	64GB	3	
	128GB	3	

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	256GB	3	
	512GB	3	
Idle	32GB	0.5	
	64GB	0.5	
	128GB	0.5	
	256GB	0.5	
	512GB	0.5	

Notes:

1. Measurement device: The General Ammeter
2. Benchmarking program: IOMeter 2008 (unit size=256KB, Outstanding I/O per target=32, Duration=1hours)

6 Environmental Specification

6.1 Temperature

Table 10 Temperature

Parameter	Value	Unit
Operating	-40 to 85	°C
Non-operating	-55 to 95	°C

Notes:

1. Test environment: High/low Temperature test chamber at third-part Company.
2. Operating Test Duration: 4 hour at every temperature(-40°C,+85°C)
3. Test Items: Cold-Boot at -40°C and Burn-in-test at +85°C

6.2 Shock

Table 11 Shock Specifications

Parameter	Acceleration Force	Unit
Operating	2000	G

Notes:

1. Test pluse shape: half sin
2. Test duration: 0.3ms

6.3 Vibration

Table 12 Vibration Specifications

Parameter	Acceleration Force	Unit
Operating	20	G

Notes:

1. Test duration: 1hour for each X,Y,Z axis 20min/sweep
2. 10~2000Hz

6.4 Humidity

Table 13 Humidity Specifications

Parameter	Acceleration Force	Unit
Operating	5 to 95	%

Notes:

1. Test duration: 24hours
2. Test methods: Samples not all products are selected to be tested.
3. Test environments: at third part

7 Reliability

7.1 Mean Time Between Failure(MTBF)

Table 14 MTBF Specifications

Parameter	Value
MTBF	8,000,000

7.2 Warranty

RC Series has lifetime warranty within BWPW(Bytes Written Permit in Warranty).

Table 10 BWPW for Each Capacity

Capacity	BWPW Value
32GB	3600TB
64GB	7200TB
128GB	14000TB
256GB	28000TB
512GB	56000TB

Notes:

1, S.M.A.R.T information in RC Series update the BWA(Bytes Written Already) in every time and tell whether BWA exceed BWPW or not.