



# Panther Military RA Series 2TB 2.5" SATA3 SSD With Amphenol Rugged SATA Connector

## Data Sheet







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## 1. Introduction

### 1.1 General Description

Panther RA series 2.5" SATA 6Gbps rugged SSD is based on proven new-generation controller, firmware, and highly reliable and MLC NAND Flash Memory technologies. Rigorous qualification in various military and industrial applications and compatibility testing ensures RA series 2TB Rugged SSD highly reliable.

To face the challenge of satisfying wide temperature working requirements, SDKSys utilizes its unique IC level tests for key IC components like NAND flash chips, and system level burning-in tests for the entire SSD solution to ensure the products meet and exceed extreme operating conditions, which ranges from -40°C to +85°C.

The advanced flash management technology designed into the device firmware allows it to achieve superior sequential and random IO performance, and improves long-term data endurance significantly. The device firmware also implements functions of Dynamic bad block management, global wear-leveling, and robust error correction code (ECC) to ensure data integrity.

### 1.2 Key Features

- **TB-class High-capacity (2TB);**
- **Rugged SATA connector**
- **MLC Nand Flash Chips based;**
- **SATA 6Gbps high-performance;**
- **Power failure recovery (Built-in voltage detectors for power failure protection; Built-in power-on reset and voltage regulators);**
- **Supports data security erase and quick erase;**
- **Conformal coating (Optional);**
- **Secure Erase Executed by Hardware Trigger (Optional);**
- **Software/ Hardware write protection (Optional);**

#### Host interface

- Industrial Standard SATA Revision 3.1 compliant
- Industrial Standard ATA/ATAPI-8 and ACS2 command compliant
- Supports SATA interface rate of 6Gb/s (backward compatible to 1.5Gb/s and 3Gb/s)
- Native Command Queuing up to 32 commands
- SATA Device Sleep (DevSleep)
- Data Set Management command (TRIM)
- Self-Monitoring, Analysis, and Reporting Technology (S.M.A.R.T.)
- Supports PHY Sleep mode (CFast PHYSLP)
- Supports 28-bit and 48-bit LBA (Logical Block Addressing)
- NCQ support up to queue depth=32
- Mode commands



## High performance

- Sustained Sequential Read: 550 MB/s
- Sustained Sequential Write: 470 MB/s

## Low power consumption

- Max read/write: 2.75/ 3.80W
- Slumber power mode: 0.60W

## Advanced Flash Management

- TRIM Support
- Global wear leveling algorithm evens program/erase count and maximizes SSD lifespan
- Bad Block Management
- Background Garbage Collection
- Hardware BCH ECC capable of correcting errors up to 66-bit/1KB

## Advanced power management

- Built-in voltage detectors for power failure protection
- Automatic sleep and wake-up mechanism to save power
- Built-in power-on reset and voltage regulators

## Ultra-reliable

- Data retention: 10 years @25C
- MTBF: >3,000,000 Hours @25C
- Compliant with MIL-STD-810F/G
- Operating shock: 3,000G, 0.5ms; 100G11ms, 1/2 sine
- Operating vibration: 30Grms, 15-2000Hz, 3 axis, 3 hours
- Operating temperature: -40°C to +85°C
- Storage temperature: -55°C to +95°C
- Static Data Refresh technology ensures data integrity
- Early weak block retirement option
- Internal data shaping technique increases data endurance
- Built-in voltage detectors for power failure protection
- Built-in power-on reset and voltage regulators
- Built-in temperature sensor for SSD temperature detection

## Enhanced Security

- Real time full drive encryption with AES
- TCG Opal protocol
- Hardware SHA 256 and TRNG



## 2. General Product Specifications

### 2.1 Interface

Panther RA series 2.5" SATA 6Gbps rugged SSD complies with the Serial ATA standard published by ANSI. The device complies with the SATA 6Gbps, Revision 3.1 specifications and supports ATA Command Set ACS-2.

### 2.2 Capacity

Raw Capacity	Unformatted Usable Capacity
2048GB	1,888 GB

Table 2- 1: Capacity Specification

### 2.3 Performance

Capacity	ATTO R/W (MB/s)		AS SSD (MB/s)				IOmeter 2008	
			Seq. R/W		4KB R/W		4KB-R	4KB-W
2TB	561	470	523.53	459.32	38.62	86.05	50,000	26,000

Table 2- 2: Performance Specification

### 2.4 Power Consumption

Input Voltage: 5V±5%

Capacity	Idle	Read	Write	Unit
2TB	0.60	2.75	3.8	<b>W</b>

Table 2-3: Power Consumption Specification

### 2.5 Endurance

Capacity	2TB
Data Retention	>10 years
Read	Unlimited
Write	5PB

Table 2- 4: Endurance Specification



### 3. Physical Specification

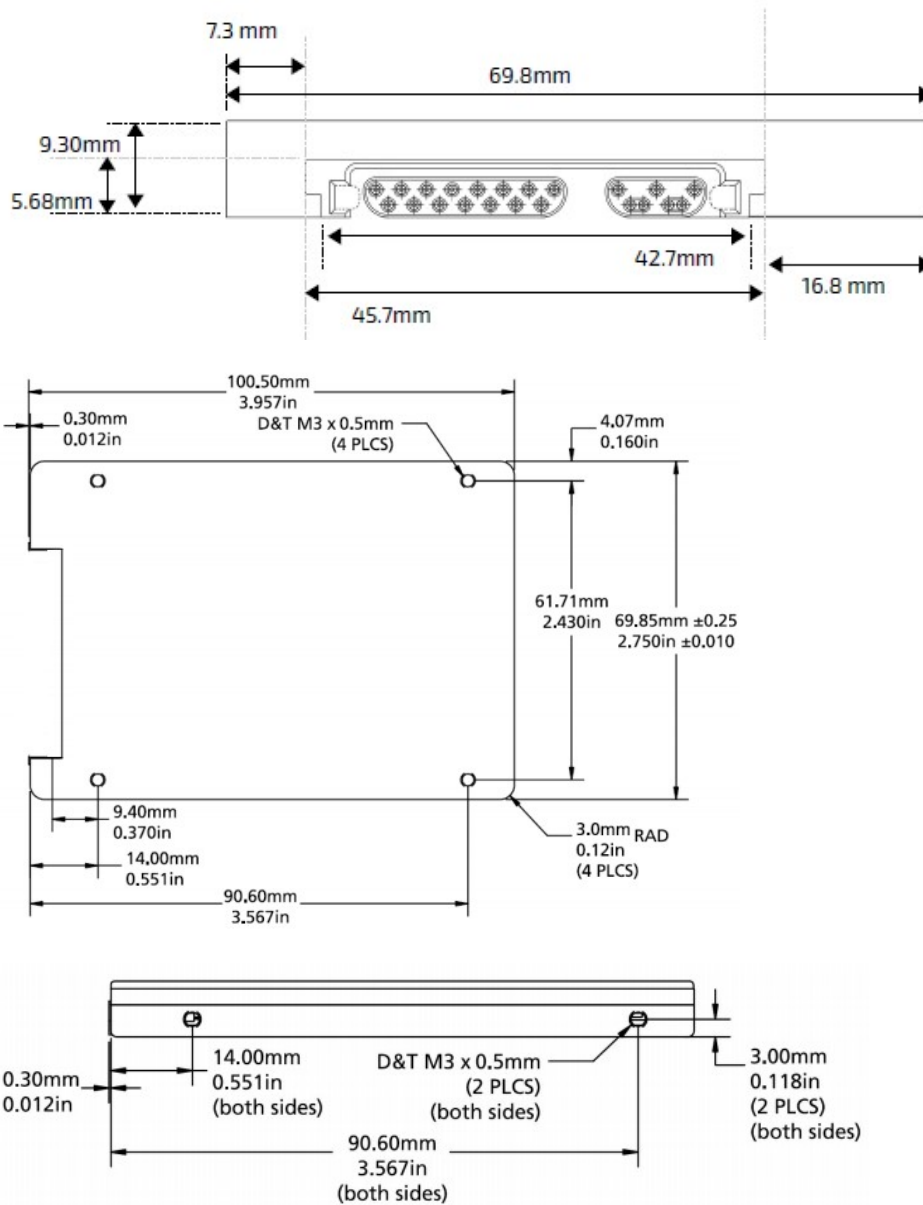


Figure 3- 1: Physical Specification

Length ( mm )	Width ( mm )	Height ( mm )
100.20 ± 0.25	69.80 ± 0.25	9.30 ± 0.1

Table 3- 1: Physical Specification



## 4. Interface

### 4.1 Supported Standards

RA series 2.5" SATA 6Gbps rugged SSD complies with the following standards:

- > SATA 6Gbps, Revision 3.1
- > ATA Command Set ACS-2

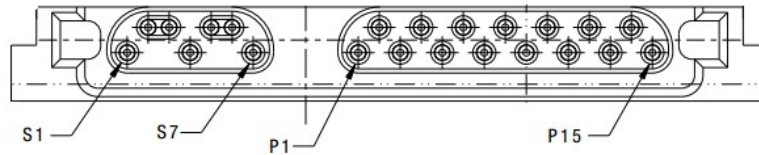


Figure 4- 1: Interface Specification

### 4.2 Pin Assignments

Pin number	Signal name	Description
<b>Signal Connector</b>		
S1	GND	2nd mate
S2	A+	Differential signal pair A From physical layer electronics
S3	A-	
S4	GND	2nd mate
S5	B-	Differential signal pair B From physical layer electronics
S6	B+	
S7	GND	2nd mate
<b>Power Connector</b>		
P1	V33	3.3V power (unused)
P2	V33	3.3V power (unused)
P3	V33	3.3V power,pre-charge,2nd mate(unused)
P4	GND	1st mate
P5	GND	2nd mate
P6	GND	2nd mate
P7	V5	5V power,pre-charge,2nd mate
P8	V5	5V power
P9	V5	5V power
P10	GND	2nd mate
P11	DAS/DSS	Device activity signal/Disable staggered spinal(unused)
P12	GND	1st mate
P13	V12	12V power,pre-charge,2nd mate(unused)
P14	V12	12V power(unused)
P15	V12	12V power(unused)

Table 4- 1: Pin Assignments Specifications





## 5. Environmental Specifications

### 5.1 Temperature

Parameter	Specifications
Operational	-40 °C to 85 °C
Storage	-55 °C to 95 °C

Table 5- 1: Temperature

### 5.2 Humidity

Parameter	Specifications
Operational/ Non-Operational	5%~95%(no condensation)

Table 5- 2: Humidity

### 5.3 Vibration

Parameter	Specifications
Operational/ Non-Operational	30Grms,15-2000Hz, 3 axis, 3 hours

Table 6- 3: Vibration

### 5.4 Shock

Parameter	Specifications
Operational	3,000G, 0.5ms; 100G11ms,1/2 sine

Table 5- 4: Shock

### 5.5 Altitude

Parameter	Specifications
Operational	80,000feet

Table 5- 5: Altitude

### 5.6 Electrostatic Discharge (ESD)

Parameter	Test Voltage
Contact	2kv,4kv
Air	4kv,8kv

Table 5- 6: Electrostatic Discharge (ESD)



## 6. Reliability Characteristics

### 6.1 Error and Bad Block Management

The SSD soft error rate specification is much better than the hard disk drive specification. In the extremely rare case that a read error does occur, SSD will recover the data by using error detection code and error correction code (ECC). The hardware Error Correction Coding engine executes parity generation and error detection/correction features, and enhances decoding throughput and data reliability.

Bad blocks are occasionally created during the life cycle of a flash component, which called dynamic bad-block accumulation. These bad blocks must be marked and replaced dynamically in order to prevent read/write failures.

### 6.2 Global Wear-leveling

Global wear leveling is employed to maximize the life span of the device. It is a block management technique to even distribution of erase counts in all the flash blocks. It can move cold data (rarely accessed data) to a block with high erase counts to average the life of every block and enhance the data reliability.

### 6.3 Garbage Collection

Garbage collection that can keep spare and cache block in a best ratio for host command execution. This feature can prevent performance downgrade due to the device running out of spare blocks and maintain the performance in an optimized level. The garbage collection operations will be dynamically adjusted by threshold values based on different host commands and situations in order to keep the device always in high performance.

## 7. Ordering Information

Model Name	Part Number	Capacity	Housing Spec
RA	SD-MG25RA2048M	2TB	9mm

Table 7- 1: Ordering information

