



August 2012

Product Specification

**Metal 2.5" SATA III MLC SSD
supports DDRIII SDRAM Cache**

MUSE-C Series

Doc-No: 100-xM2SR-VCML-01V1



*This document is for information use only and is **subject to change without prior notice**. APRO Co., Ltd. Assumes no responsibility for any errors that may appear in this document, nor for incidental or consequential damages resulting from the furnishing, performance or use of this material. No part of this document may be reproduced, transmitted, transcribed, stored in a retrievable manner or translated into any language or computer language, in any form or by any means, electronic, mechanical, magnetic, optical, chemical, manual or otherwise, without the prior written consent of an officer of APRO Co., Ltd.*

All parts of the APRO documentation are protected by copyright law and all rights are reserved.

APRO and the APRO logo are registered trademarks of APRO Co., Ltd.

Product names mentioned herein are for identification purposes only and may be trademarks and/or registered trademarks of their respective companies.

© 2012 APRO Corporation. All rights reserved.

Revision History

Revision	Description	Date
1.0	Initial release	2012/3/12
1.1	Warranty period : revised from 1 year to 2 years	2012/8/13

CONTENTS

1. INTRODUCTION	- 1 -
1.1. SCOPE	- 2 -
1.2. SYSTEM FEATURES	- 2 -
1.3. FLASH MANAGEMENT TECHNOLOGY - GLOBAL WEAR LEVELING	- 2 -
2. PRODUCT SPECIFICATIONS	- 3 -
2.1. SYSTEM ENVIRONMENTAL SPECIFICATIONS	- 3 -
2.2. SYSTEM POWER REQUIREMENTS	- 3 -
2.3. SYSTEM PERFORMANCE	- 3 -
- WINDOWS 7 OPERATING SYSTEM	- 3 -
2.4. SYSTEM RELIABILITY	- 4 -
2.5. CAPACITY SPECIFICATIONS	- 4 -
2.6. PHYSICAL SPECIFICATIONS	- 4 -
3. INTERFACE DESCRIPTION	- 6 -
3.1. METAL 2.5" SATA III SSD INTERFACE	- 6 -
3.2. PIN ASSIGNMENTS	- 6 -
4. ELECTRICAL SPECIFICATION	- 8 -
4.1. DEVICE ELECTRICAL CHARACTERISTICS	- 8 -
5. COMMAND SETS	- 9 -
5.1. ATA COMMAND	- 9 -
APPENDIX A. ORDERING INFORMATION	- 16 -
PART NUMBER LIST:	- 16 -
PART NUMBER DECODER:	- 16 -
APPENDIX B. LIMITED WARRANTY	- 17 -

List of Tables

TABLE 1: ENVIRONMENTAL SPECIFICATION	- 3 -
TABLE 2: POWER REQUIREMENT	- 3 -
TABLE 3: SYSTEM PERFORMANCES	- 3 -
TABLE 4: IOPS (I/O ACCESS TIME PER SECOND)	- 4 -
TABLE 5: SYSTEM RELIABILITY.....	- 4 -
TABLE 6: DEVICE PARAMETERS.....	- 4 -
TABLE 7: PHYSICAL SPECIFICATIONS.....	- 4 -
TABLE 8: PIN ASSIGNMENTS.....	- 6 -
TABLE 9: ABSOLUTE MAXIMUM RATINGS	- 8 -
TABLE 10: RECOMMENDED POWER SUPPLY OPERATION CONDITIONS.....	- 8 -
TABLE 11: RETURNED SECTOR DATA.....	- 10 -
TABLE 12: THE TABLE BELOW LISTS THE SMART COMMANDS.....	- 13 -

List of Figures

FIGURE 1: METAL 2.5" SATA III MLC SSD MUSE-C SERIES CONTROLLER BLOCK DIAGRAM	- 1 -
FIGURE 2: METAL 2.5" SATA III MLC SSD DIMENSION	- 5 -
FIGURE 3: 2.5" SATA III MLC SSD INTERFACE.....	- 6 -

1. Introduction

APRO Metal 2.5" SATA III MLC SSD – MUSE-C Series provide high capacity flash memory Solid State Drive (SSD) that electrically complies with Serial ATA 3.0 (SATA) standard. APRO Metal 2.5" SATA III MLC SSD – MUSE-C Series supports up to SATA Gen-III (6.0 Gb/s) with high performance. The main used flash memories are MLC-NAND type flash memory chips. The available disk capacities are 64GB, 128GB, 256GB and 512GB. The operating temperature grade is optional for commercial level 0°C ~ 70°C and wide temperature level -40°C ~ +85°C. The data transfer performance by sustained read is up to 540.4 MB/sec (AHCI mode), and sustained write is up to 444.2 MB/sec (AHCI mode).

The APRO Metal 2.5" SATA III MLC SSD supports DDRIII SDRAM Cache provide a high level interface to the host computer. This interface allows a host computer to issue commands to the metal 2.5" SATA III MLC SSD to read or write blocks of memory. Each sector is protected by a powerful 48 bits per 2KB Error Correcting Code (ECC). APRO Metal 2.5" SATA III MLC SSD MUSE-C Series intelligent controller manages interface protocols, data storage and retrieval as well as ECC, defect handling and diagnostics, power management and clock control.

Figure 1 shows a block diagram of the used high tech Metal 2.5" SATA III MLC SSD controller.

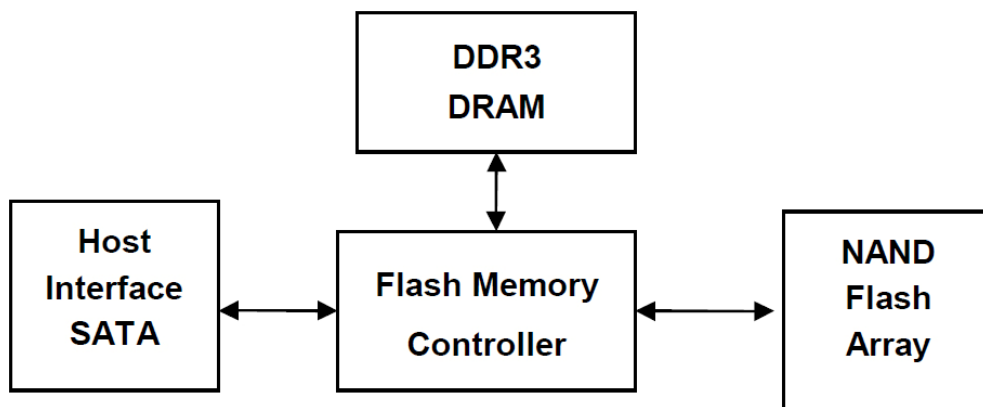


Figure 1: Metal 2.5" SATA III MLC SSD MUSE-C Series controller block diagram

1.1. **Scope**

This document describes the features and specifications and installation guide of APRO's Metal 2.5" SATA III MLC SSDs – MUSE-C Series. In the appendix, there provides order information, warranty policy, RMA/DOA procedure for the most convenient reference.

1.2. **System Features**

- MLC-NAND type flash technology
- Standard 2.5 inch disk drive form-factor
- ATA / ATAPI-8 compliant
- SATA 7 pins (data) + 15 pins (power connector) host Interface
- Serial ATA 6Gb/s compatible with SATA 3Gb/s and SATA 1.5G/s
- Supports SMART function (Self-Monitoring, Analysis and Reporting Technology)
- Supports TRIM function
- Supports Native Command Queuing (NCQ) command
- Non-volatile memory and no moving parts
- Capacity from 64GB up to 512GB
- 64GB SSD with DDRIII SDRAM 128MB cache buffer
- 128GB SSD with DDRIII SDRAM 256MB cache buffer
- 256GB / 512GB SSD with DDRIII SDRAM 512MB cache buffer
- Performance up to 540.4 MB/sec (AHCI mode)
- 48 bits per 2KB Error Correcting Code (ECC), error correction and retry capabilities
- +5 V \pm 10% operation
- MTBF > 1,500,000 hours
- Vibration : 800Hz, 3.08G
- Shock : 1,500G
- Very high performance, very low power consumption
- Low weight, Noiseless

1.3. **Flash Management Technology - Global Wear Leveling**

The APRO MUSE-C Series Metal 2.5" SATA III MLC SSD, which supports global Wear-Leveling algorithms. The Wear-leveling command is supported to ensure the best of flash memory endurance capability.

2. Product Specifications

For all the following specifications, values are defined at ambient temperature and nominal supply voltage unless otherwise stated.

2.1. System Environmental Specifications

Table 1: Environmental Specification

APRO Metal 2.5" SATA III MLC SSD MUSE-C Series		Commercial Grade	Wide Temperature
Temperature	Operating:	0°C ~ +70°C	-40°C ~ +85°C
	Non-operating:	-20°C ~ +80°C	-50°C ~ +95°C
Humidity	Operating & Non-operating:	10% ~ 95% non-condensing	
Vibration	Operating & Non-operating:	800Hz, 3.08G	
Shock	Operating & Non-operating:	1,500G	

2.2. System Power Requirements

Table 2: Power Requirement

APRO Metal 2.5" SATA III SSD MUSE-C Series		Standard Grade	Wide Temperature
DC Input Voltage (VCC) 100mV max. ripple(p-p)		5V±10%	
+5V Current (Maximum average value)	Reading Mode :	230 mA (max.)	
	Writing Mode :	710 mA (max.)	
	Idle Mode :	70 mA (max.)	

2.3. System Performance

Table 3: System Performances

Data Transfer Mode supporting		Serial ATA 6Gb/s compatible with SATA 3Gb/s and SATA 1.5G/s			
Average Access Time		0.0 ms			
Maximum Performance	Capacity	64GB	128GB	256GB	512GB
	Sequential Read (MB/s)	531.5	539.2	540.4	527.6
	Sequential Write(MB/s)	189.9	348.6	444.2	441.0
Maximum QD 32	4K Random Read (MB/s)	229	299	300	224
	4K Random Write (MB/s)	188	266	271	121
The number of Flash IC		4pcs	8pcs	8pcs	8pcs

Note:

- (1). All values quoted are typically at 25°C and nominal supply voltage.
- (2). Testing of the Metal 2.5" SATA III MLC SSD maximum performance was performed under the following platform:
 - ASUS P8Z68 PRO Motherboard
 - Windows 7 operating system

Table 4: IOPS (I/O access time Per Second)

I/O Per Second		4K Data Size Transfer / QD64 Test / AHCI Mode			
Maximum Performance	Capacity	64GB	128GB	256GB	512GB
	Random Read IOPS	52,862	72,521	72,796	52,076
	Random Write IOPS	41,886	60,807	61,796	30,324

2.4. System Reliability

Table 5: System Reliability

MTBF	>1,500,000 hours
Wear-leveling Algorithms	Global Wear Leveling
Bad Blocks Management	Supportive
ECC Technology	48 bits per 2KB block
Data Retention	10 years

2.5. Capacity Specifications

The table 6 shows the specific capacity for the various models and the default number of heads, sectors/track and cylinders.

Table 6: Device Parameters

Unformatted Capacity	Default Cylinder	Default Head	Default Sector	LBA
64GB	16,383	16	63	125,045,424
128GB	16,383	16	63	250,069,680
256GB	16,383	16	63	500,118,192
512GB	16,383	16	63	1,000,215,216

2.6. Physical Specifications

Refer to Table 7 and see Figure 2 for Metal 2.5" SATA III MLC SSD MUSE-C Series physical specifications and dimensions.

Table 7: Physical Specifications

Length:	100 mm / 3.937 in
Width:	69.80 mm / 2.748 in
Thickness:	9.50 mm / 0.374 in
Weight:	73.00 g / 2.57 oz

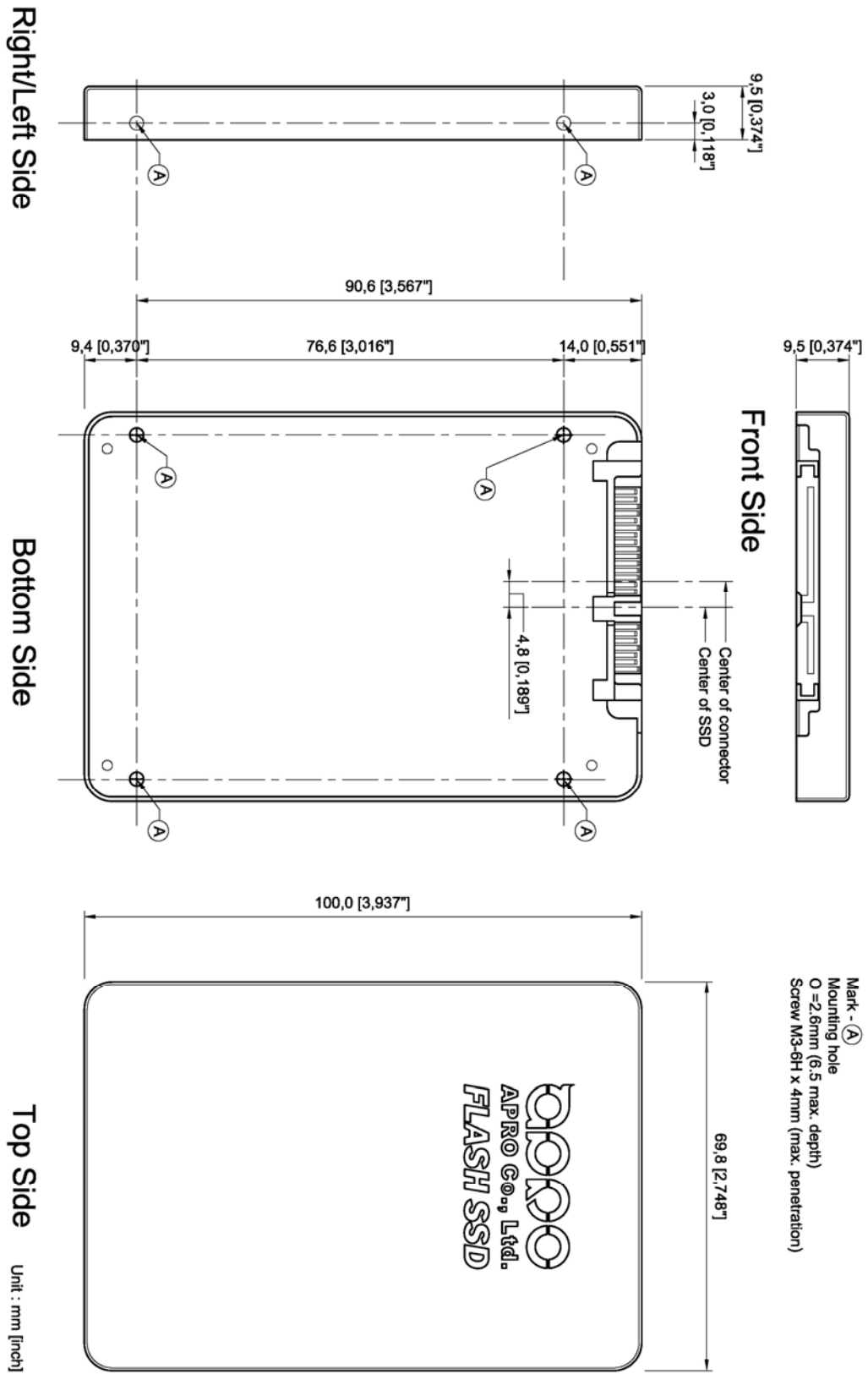


Figure 2: Metal 2.5" SATA III MLC SSD Dimension

3. Interface Description

3.1. Metal 2.5" SATA III SSD interface

APRO Metal 2.5" SATA III MLC SSD comes with 7 pins + 15 pins Serial ATA connector.

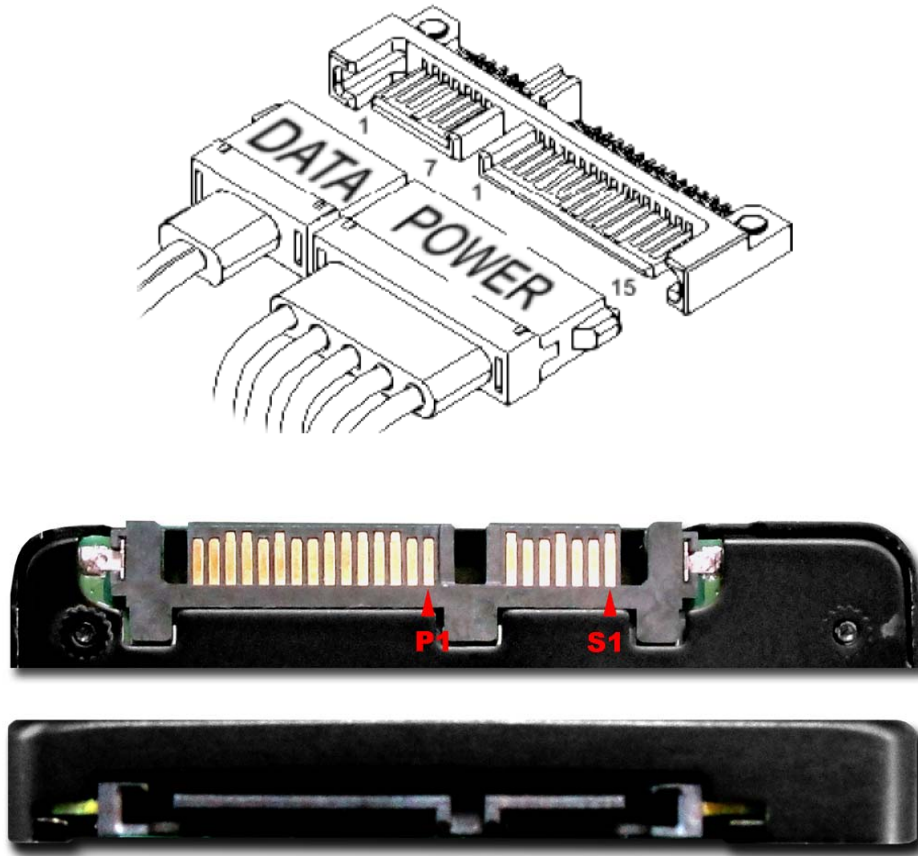


Figure 3: 2.5" SATA III MLC SSD Interface

3.2. Pin Assignments

There are total of 7 pins in the signal segment and 15 pins in the power segment. The pin assignments are listed in below table 8.

Table 8: Pin Assignments

Name	Type	Description
S1	GND	
S2	A+	Differential Signal Pair A
S3	A-	

S4	GND	
S5	B-	Differential Signal Pair B
S6	B+	
S7	GND	
Key and Spacing separate signal and power segments		
P1	V33	3.3V Power (No Use)
P2	V33	3.3V Power (No Use)
P3	V33	3.3V Power, Pre-charge (No Use)
P4	GND	
P5	GND	
P6	GND	
P7	V5	5V Power, Pre-Charge
P8	V5	5V Power
P9	V5	5V Power
P10	GND	
P11	DAS/DSS	Device Activity Signal / Disable Staggered Spin up
P12	GND	
P13	V12	12V Power, Pre-charge (No Use)
P14	V12	12V Power (No Use)
P15	V12	12V Power (No Use)

Notes:

1. All pins are in a signal row with a 1.27 mm (0.050" pitch).
2. The commands on the mating sequence in forward table apply to the case of backplane blind mate connector only. In this case, the mating sequences are:
 - (1) The pre-charge power pins and other ground pins.
 - (2) The signal pins and the rest of the power pins.

4. Electrical Specification

4.1. Device Electrical Characteristics

Table 9: Absolute Maximum Ratings

Parameter	Symbol	Condition	Min	Max	Unit
Analog power supply	AV_{DDH}		-0.5	6	V
Digital I/O power supply	DV_{DD}		-0.5	6	V
Digital I/O input voltage	$V_{I(D)}$		-0.4	$DV_{DD}+0.4$	V
Storage temperature	$T_{STORAGE}$		-55	140	°C

Table 10: Recommended Power Supply Operation Conditions

Parameter	Symbol	Condition	Min	Typical	Max	Unit
DC Power Supply	V_{DD}		-0.3		+5.5	V
Input voltage	V_{IN}		-0.3		+5.5	V
Operating Temperature	T_A	Standard	0		+70	°C
		Wide Temperature	-40		+85	°C
Storage Temperature	T_{ST}	Standard	-20		+80	°C
		Wide Temperature	-50		+95	°C

5. Command Sets

5.1. ATA Command

MUSE-C Series 2.5" SATA III MLC SSD supports all the mandatory ATA commands defined in the ATA/ATAPI-8 specification.

5.1.1. ATA General Feature Command Set

MUSE-C Series 2.5" SATA III MLC SSD supports the ATA general feature command set, which consists:

- EXECUTE DEVICE DIAGNOSTIC
- FLUSH CACHE
- IDENTIFY DEVICE
- READ DMA
- READ SECTOR(S)
- READ VERIFY SECTORS(S)
- SEEK
- SET FEATURES
- WRITE DMA
- WRITE SECTOR(S)
- READ MULTIPLE
- SET MULTIPLE MODE
- WRITE MULTIPLE

The Metal 2.5" SATA III MLC SSD – MUSE-C Series SATA SSD supports all the following optional commands

- READ BUFFER
- WRITE BUFFER
- NOP
- DOWNLOAD MICROCODE

5.1.1.1. Identify Device Data

The following table details the sector data returned after issuing an IDENTIFY DEVICE command.

Table 11: Returned Sector Data

Word	F=Fixed V=Variable X=Both	Default Value	Description
0	F	0040h	General configuration bit-significant information
1	X	3FFFh	Obsolete-Number of logical cylinders (16,383)
2	V	C837h	Specific configuration
3	X	0010h	Obsolete-Number of logical heads (16)
4-5	X	0h	Retired
6	X	003Fh	Obsolete-Number of logical sectors per logical track (63)
7-8	V	0h	Reserved
9	X	0h	Retired
10-19	F	varies	Serial number (20 ASCII characters)
20-21	X	0h	Retired
22	X	0h	Obsolete
23-26	F	varies	Firmware revision (8 ASCII characters)
27-46	F	varies	Model number
47	F	8010h	7:0 – Maximum number of sectors transferred per interrupt on multiple commands
48	F	0h	Reserved
49	F	2F00h	Capabilities
50	F	4000h	Capabilities
51-52	X	0h	Obsolete
53	F	0007h	Words 88 and 70:64 valid
54	X	3FFFh	Obsolete - Number of logical cylinders (16,383)
55	X	0010h	Obsolete - Number of logical heads (16)
56	X	003Fh	Obsolete - Number of logical sectors per logical track (63)
57-58	X	00FBFC10h	Obsolete
59	F	0101h	Number of sectors transferred per interrupt on multiple commands
60-62	F	125,045,424 (64GB)	Total number of user addressable sectors
		250,069,680 (128GB)	
		500,118,192 (256GB)	
		1,000,215,216 (512GB)	
63	F	0007h	Multi-word DMA modes supported/selected
64	F	0003h	PIO modes supported
65	F	0078h	Minimum multiword DMA transfer cycle time per word

66	F	0078h	Manufacture's recommended multiword DMA transfer cycle time
67	F	0078h	Minimum PIO transfer cycle time without flow control
68	F	0078h	Manufacture's recommended multiword DMA transfer cycle time
69-70	F	0h	Reserved
71-74	F	0h	Reserved
75	F	001Eh	Queue depth
76	F	0106h	Serial ATA capabilities
77	F	0h	Reserved
78	F	0048h	Serial ATA features supported
79	V	0040h	Serial ATA features enabled
80	F	00FCh	Major Version Number
81	F	001Ah	Minor Version number
82	F	746Bh	Command set supported
83	F	7C01h	Command sets supported
84	F	6023h	Command set /feature supported extension
85	V	7469h	Command set /feature enabled
86	V	BC01h	Command set /feature enabled
87	V	6123h	Command set /feature default
88	V	407Fh	Ultra DMA modes
89	F	0001h	Time required for security erase unit completion
90	F	0001h	Time required for enhanced security erase completion
91	V	0h	Current advanced power management value
92	V	0FFFEh	Master Password Revision Code
93	F	0h	Hardware reset result. The contents of bits (12:0) of this word shall change only during the execution of a hardware reset.
94	V	0h	Vendor's recommended and actual acoustic management value
95	F	0h	Stream Minimum Request Size
96	V	0h	Streaming Transfer Time - DMA
97	V	0h	Streaming Access Latency - DMA and PIO
98-99	F	0h	Streaming Performance Granularity
100-103	V	125,045,424 (64GB)	Total Number of user LBA for 48-bit Address feature set
		250,069,680 (128GB)	
		500,118,192 (256GB)	
		1,000,215,216 (512GB)	
104	V	0h	Streaming Transfer Time - PIO
105	F	0h	Reserved
106	F	4000h	Physical sector size/logical sector size
107	F	0h	Inter-seek delay for ISO-7779 acoustic testing

			in microseconds
108-111	F	varies	Unique ID
112-115	F	0h	Reserved for word wide name extension to 128 bits
116	V	0h	Reserved for technical report
117-118	F	0h	Words per logical sector
119	F	401Ch	Supported settings
120	F	401Ch	Command set/feature enabled/Supported
121-126	F	0h	Reserved
127	F	0h	Removable Media Status Notification feature set support
128	V	0021h	Security status
129-159	X	0h	Vendor specific
160	F	0h	Compact Flash Association (CFA) power mode 1
161-175	X	0h	Reserved for assignment by the Compact Flash Association
176-205	V	0h	Current media serial number
206-216	F	0h	Reserved
217	F	0001h	Non-rotating media device
218-221	F	0h	Reserved
222	F	101F	Reserved
223-233	F	0h	Reserved
234		0001h	Reserved
235		02A0h	Reserved
236-254	F	0h	Reserved
255	X	varies	Integrity word(checksum and signature)

Notes:

1. *F=Fixed. The content of the word is fixed and does not change for removable media devices, these values may change when media is Removed or changed.*
2. *V=Variable. The state of at least one bit in a word is variable and may change depending on the state of the device or the commands executed by the device.*
3. *X=F or V. The content of the word may be fixed or variable.*

5.1.2. Power Management Command Set

MUSE-C Series 2.5" SATA III MLC SSD supports the power management command set, which consists:

- CHECK POWER MODE
- IDLE
- IDLE IMMEDIATE
- SLEEP
- STANDBY
- STANDBY IMMEDIATE

5.1.3. Security Mode Feature Set

MUSE-C Series 2.5" SATA III MLC SSD supports the Security Mode command set, which consists:

- SECURITY SET PASSWORD
- SECURITY UNLOCK

- SECURITY ERASE PREPARE
- SECURITY ERASE UNIT
- SECURITY FREEZE LOCK
- SECURITY DISABLE PASSWORD

5.1.4. SMART Command Set

MUSE-C Series 2.5" SATA III MLC SSD supports the SMART command set, which consists:

- SMART ENABLE OPERATIONS
- SMART DISABLE OPERATIONS
- SMART ENABLE/DISABLE AUTOSAVE
- SMART RETURN STATUS

The MUSE-C Series 2.5" SATA III MLC SSD supports the following optional commands.

- SMART EXECUTE OFF-LINE IMMEDIATE
- SMART READ DATA
- SMART READ LOG
- SMART WRITE LOG

Table 12: The table below lists the SMART commands

Subcommand	Code	LBA Low Value
Read Attribute Values (Read Data)	D0h	
Read Attribute Thresholds	D1h	
Enable/Disable Attribute Autosave	D2h	
Save Attribute Values	D3h	
Execute Off-line Immediate	D4h	
Execute SMART Off-Line routine		00h
Execute SMART Short Self-test routine (Off-Line)		01h
Execute SMART Extended Self-test routine (Off-Line)		02h
Abort Off-Line routine		7Fh
Execute SMART Short Self-test routine (Captive)		81h
Execute SMART Extended Self-test routine (Captive)		82h
Read Log Sector	D5h	
Write Log Sector	D6h	
Enable SMART Operations	D8h	
Disable SMART Operations	D9h	
Return SMART Status	DAh	

5.1.5. Host Protected Area Command Set

- MUSE-C Series 2.5" SATA III MLC SSD supports the Host Protected Area command set which consists:
- READ NATIVE MAX ADDRESS
- SET MAX ADDRESS
- READ NATIVE MAX ADDRESS EXT
- SET MAX ADDRESS EXT

MUSE-C Series 2.5" SATA III MLC SSD supports the following optional commands.

- SET MAX SET PASSWORD
- SET MAX LOCK
- SET MAX FREEZE LOCK
- SET MAX UNLOCK

5.1.6. 48-Bit Address Command Set

MUSE-C Series 2.5" SATA III MLC SSD supports the Host Protected Area command set, which consists:

- READ NATIVE MAX ADDRESS
- FLUSH CACHE EXT
- READ DMA EXT
- READ NATIVE MAX ADDRESS EXT
- READ SECTOR(S) EXT
- READ VERIFY SECTOR(S) EXT
- SET MAX ADDRESS EXT
- WRITE DMA EXT
- WRITE MULTIPLE EXT
- WRITE SECTOR(S) EXT

5.1.7. Device Configuration Overlay Command Set

MUSE-C Series 2.5" SATA III MLC SSD supports the Device configuration Overlay command set, which consists:

- DEVICE CONFIGURATION FREEZE LOCK
- DEVICE CONFIGURATION IDENTITY
- DEVICE CONFIGURATION RESTORE
- DEVICE CONFIGURATION SET

5.1.8. General Purpose log Command Set

MUSE-C Series 2.5" SATA III MLC SSD supports the general purpose log command set, which consists:

- READ LOG EXT
- WRITE LOG EXT

5.1.9. SATA Commands

The SATA 3.0 specification is a super set of the ATA/ATAPI-8 specification with regard to supported commands. MUSE-C Series 2.5" SATA III MLC SSD supports the following features which are unique to SATA Specification.

5.1.10. Software Settings Preservation

The MUSE-C Series 2.5" SATA III MLC SSD supports the SET FEATURES parameter to enable/disable the preservation of software settings.

5.1.11. Native Command Queuing

MUSE-C Series 2.5" SATA III MLC SSD supports the Native Command Queuing (NCQ) command set, which includes:

- READ FPDMA QUEUED
- WRITE FPDMA QUEUED

Note: with a maximum queue depth equal to 32

Appendix A. Ordering Information

Part Number List:

◆ Metal 2.5" SATA III MLC SSD – MUSE-C Series

Grade	Standard grade (0°C ~ 70°C)	Wide Temperature (-40°C ~ +85°C)
64GB	SM2SR064G-VCCTM	WM2SR064G-VCCTM-C
128GB	SM2SR128G-VCCTM	WM2SR128G-VCCTM-C
256GB	SM2SR256G-VCCTM	WM2SR256G-VCCTM-C
512GB	SM2SR512G-VCCTM	WM2SR512G-VCCTM-C

Part Number Decoder:

X1 X2 X3 X4 X5 X6 X7 X8 X9 – X11 X12 X13 X14 X15 – C

X1 : Grade

S: Standard Grade – operating temp. 0° C ~ 70 ° C

W: Wide Temperature – operating temp. -40° C ~ +85 ° C

X2 : The material of case

M : Metal Casing

X3 X4 X5 : Product category

2SR : 2.5" SATA III SSD supports DDRIII SDRAM cache

X6 X7 X8 X9 : Capacity

064G: 64GB **256G:** 256GB

128G: 128GB **512G:** 512GB

X11 : Controller

V : MUSE Series

X12 : Controller version

A,B,C.....

X13 : Controller Grade

C : Commercial grade

X14 : Flash IC

T : Toshiba Flash IC

X15 : Flash IC grade / Type

M : MLC-NAND flash IC

C : Reserved for specific requirement

C : Conformal-coating

Appendix B. Limited Warranty

APRO warrants your Metal 2.5" SATA III MLC SSD against defects in material and workmanship for the life of the drive. The warranty is void in the case of misuse, accident, alteration, improper installation, misapplication or the result of unauthorized service or repair. The implied warranties of merchantability and fitness for a particular purpose, and all other warranties, expressed or implied, except as set forth in this warranty, shall not apply to the products delivered. In no event shall APRO be liable for any lost profits, lost savings or other incidental or consequential damages arising out of the use of, or inability to use, this product.

BEFORE RETURNING PRODUCT, A RETURN MATERIAL AUTHORIZATION (RMA) MUST BE OBTAINED FROM APRO.

Product shall be returned to APRO with shipping prepaid. If the product fails to conform based on customers' purchasing orders, APRO will reimburse customers for the transportation charges incurred.

Warranty period:

- SM2SRxxxG-VCCTM 2 years
- WM2SRxxxG-VCCTM-C 2 years



The warranty period is able to extend. Please contact APRO or Your APRO distributors for more information.