

SMART Embedded Products

SMART Value Series M.2 SATA SSD 2242

PN: SV9M2S46DxxxGJMxx



April 2015, Rev B



www.smartm.com

REVISION HISTORY

Date	Revision	Section(s)	Description
August 2014	A	All	Preliminary Release
April 2015	B	1.2, 1.4.1, 1.4.2, 2.2, 3.1.2, & 5.0.	Add 64GB (BGA) part, update associated measurements, and mechanical specification.



ESD Caution – Handling

Static electricity may be discharged through this disk subsystem. In extreme cases, this may temporarily interrupt the operation or damage components. To prevent this, make sure you are working in an ESD-safe environment. For example, before handling the disk subsystem, touch a grounded device, such as a computer case, prior to handling.

SMART Modular Technologies

39870 Eureka Dr.
Newark, CA 94560
(510) 623-1231 voice
(510) 623-1434 fax
info@smartm.com
An ISO 9001 certified company.

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Corporate Headquarters: 39870 Eureka Dr, Newark, CA 94560, USA • Tel:(510) 623-1231 • Fax:(510) 623-1434 • E-mail: info@smartm.com
Flash Design Center: 2 Highwood Dr, Suite 101, Tewksbury, MA 01876 USA • Tel:(978) 221-3500 • Fax:(978) 303-8757
Asia: Plot 18, Lrg Jelawat 4, Kawasan Perindustrian Seberang Jaya 13700, Prai, Penang, Malaysia • Tel: +604-3992909 • Fax: +604-3992903

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1. GENERAL DESCRIPTION

1.1. Overview

The SMART Modular M.2 SATA embedded (internal) SATA module is a robust, solid state drive product. This drive specifically targets the needs of OEM markets, such as server, storage cache/accelerators, networking, and data communications applications requiring reliable internal storage with a small footprint. The embedded products are also a natural fit for mobile and embedded computing, medical, automotive, and industrial applications. The low power consumption and fast data throughput are major advantages of the SMART Modular M.2 SATA modules over traditional rotating hard disk drives (HDDs).

Utilizing an industry-standard SATA interface and connector, M.2 SATA modules are easily integrated into a host system without any special BIOS modifications or additional device drivers. These products offer sustained read performance up to 530 MBytes/sec and sustained write performance of up to 190 MBytes/sec. These modules are available in capacities of 8 GBytes to 128 GBytes.

SMART Modular M.2 SATA products address the need for enhanced reliability by incorporating on-board error detection and correction and static wear leveling algorithms to provide reliable operation over the product life cycle.

SMART has built its foundation by providing proven technology and quality products to the most demanding Fortune 100 OEMs. SMART engineers its products to perform at the highest degree of reliability and compatibility while backing these products with outstanding services and technology expertise.

1.2. Features

- **Form Factor:** PCI Express M.2 Specification, M.2 2242-D2-B-M
- **Interface:** Industry standard Serial ATA, SATA 3.0 compliant
- **Supported SATA Modes**
 - **PIO Modes:** 0-4
 - **Multiword DMA Modes:** 0-2
 - **Ultra DMA Modes:** 0-6
- **SATA Interface Transfer Rate:** 6 Gbps with support for 3 Gbps & 1.5 Gbps
- **NAND Technology:** Multi-Level Cell (MLC)
- **Capacity:** 8 to 128 GBytes
- **Data Rates:**
 - **Read:**
 - Up to 530 MB/s (64GB (BGA), 128GB)
 - Up to 280 MB/s (16 – 32GB, 64GB (TSOP))
 - Up to 150 MB/s (8 GB)
 - **Write:**
 - up to 190 MB/s (64GB (BGA), 128GB)
 - up to 170 MB/s (16 – 32GB, 64GB (TSOP))
 - up to 90 MB/s (8 GB)
- **Operating Temperature:** 0°C to +70°C
- **Storage Temperature:** -40 °C to +85 °C
- **Input Power:**
 - V_{CC} : 3.3 V \pm 5%

1.3. Unique Features

- Static and Dynamic Wear Leveling
- Advanced Error Detection/Correction circuitry for superior data reliability
- Self-Monitoring Analysis and Reporting Technology (S.M.A.R.T.) support
- Supports for 48bit LBA addressing with larger max transfer size
- Improved shock and vibration performance over rotating media
- ATA and SATA Interface Power Management Support
- External LED Activity Signaling through the connector
- Native Command Queuing (NCQ) support with a maximum queue depth of 32
- Zero seek time
- Noiseless operation
- Supports TRIM command based on the ATA-8 Standard
- Supports ATA Download Microcode
- Low power management
 - DIPM/HIPM Mode
- Bad Block Management

1.4. Operational Characteristics

All listed values are typical unless otherwise stated.

1.4.1. Performance

Table 1: Performance Characteristics

Item	Capacity	Performance Max
128K Sequential Read sustained	128GB	530 MB/s
	64GB (BGA)	530 MB/s
	64GB (TSOP)	280 MB/s
	32GB	280 MB/s
	16GB	280 MB/s
	8GB	150 MB/s
128K Sequential Write Sustained	128GB	190 MB/s
	64GB (BGA)	190 MB/s
	64GB (TSOP)	170 MB/s
	32GB	170 MB/s
	16GB	170 MB/s
	8GB	90 MB/s
4K Random Read Maximum	All	41K IOPS
4K Random Write Maximum	All	29K IOPS
Host Interface Transfer Rate	All	6.0 Gbps / 3.0 Gbps / 1.5 Gbps (depends on host connection)
Response Time	All	< 1500ms (max) < 5ms (typical)

1. Tested on ASUS Q87M-Plus + i7 + Win7 64bit + 16GB RAM
2. Test result obtained with IOMeter V1.1 running 'full random' data pattern
3. Power Consumption may differ according to flash configuration, SDR configuration, and platform

1.4.2. Power

Table 2: Power Requirements (3.3V)

Parameter	Value (Typ)	Value (Max)	Unit
Vcc	3.3	3.6	V
Read	333	522	mA
Write	347	497	mA
Idle	83	83	mA

Table 3: Power Consumption

Capacity	Read	Write	Partial	Slumber	Idle	Unit
8GB	1,140	870	45	30	275	mW
16GB	1,105	1,165	45	25	275	mW
32GB	1,100	1,145	45	25.5	275	mW
64GB (TSOP)	1,725	1,450	45	26	275	mW
64GB (BGA)	1,730	1,550	46	26	275	mW
128GB	1,705	1,640	47	26.5	275	mW

1. The average value of power consumption is achieved based on 100% conversion efficiency.
2. The measured power voltage is 3.3V.
3. Samples were built using Toshiba A19nm Toggle MLC NAND flash and measured under ambient temperature.
4. Sequential R/W is measured while testing 4000MB sequential R/W 5 times by CrystalDiskMark.
5. Power Consumption may differ according to flash configuration, SDR configuration, and platform.

1.4.3. Reliability

Table 4: Reliability Characteristics

Item	Value	
Mean Time Between Failures (MTBF)	> 2 Million hours	
Data Reliability	< 1.0E-15 uncorrectable error rate	
Data Retention (@ 25°C)	10 years > 90% life remaining	
	1 year < 10% life remaining	
Endurance ¹	8GB	19 TBW
	16GB	39 TBW
	32GB	79 TBW
	64GB	158 TBW
	128GB	317 TBW
Error Correction / Error Detection	Up to 43 bits for every 1 Kbyte sector	

¹Endurance for 100% Sequential Workload; endurance is directly related to the User Specific Workload

1.4.4. Environmental Conditions

Table 5: Environmental Conditions and Testing

Parameter	Value
Shock	1500G half-sine, 0.5 msec, 1 shock along each axis, X,Y,Z in each direction
Vibration	20G 80-2000Hz, 1.52mm 20-80Hz, 3 axis
Operating Temperature - Commercial	0°C to 70°C
Storage Temperature	-40°C to 85°C
Humidity	40°C, Operation: 90% RH, Storage: 93% RH
Altitude	24,384 m [80,000 ft]
Drop	80cm, 6 face
Bending	≥ 20N
Torque	0.5N-m or ±2.5 deg
ESD	64 GB / 128 GB, 24.0°C, 49% (RH), +/- 4KV

1.4.5. Physical Characteristics

Table 6: Physical Characteristics

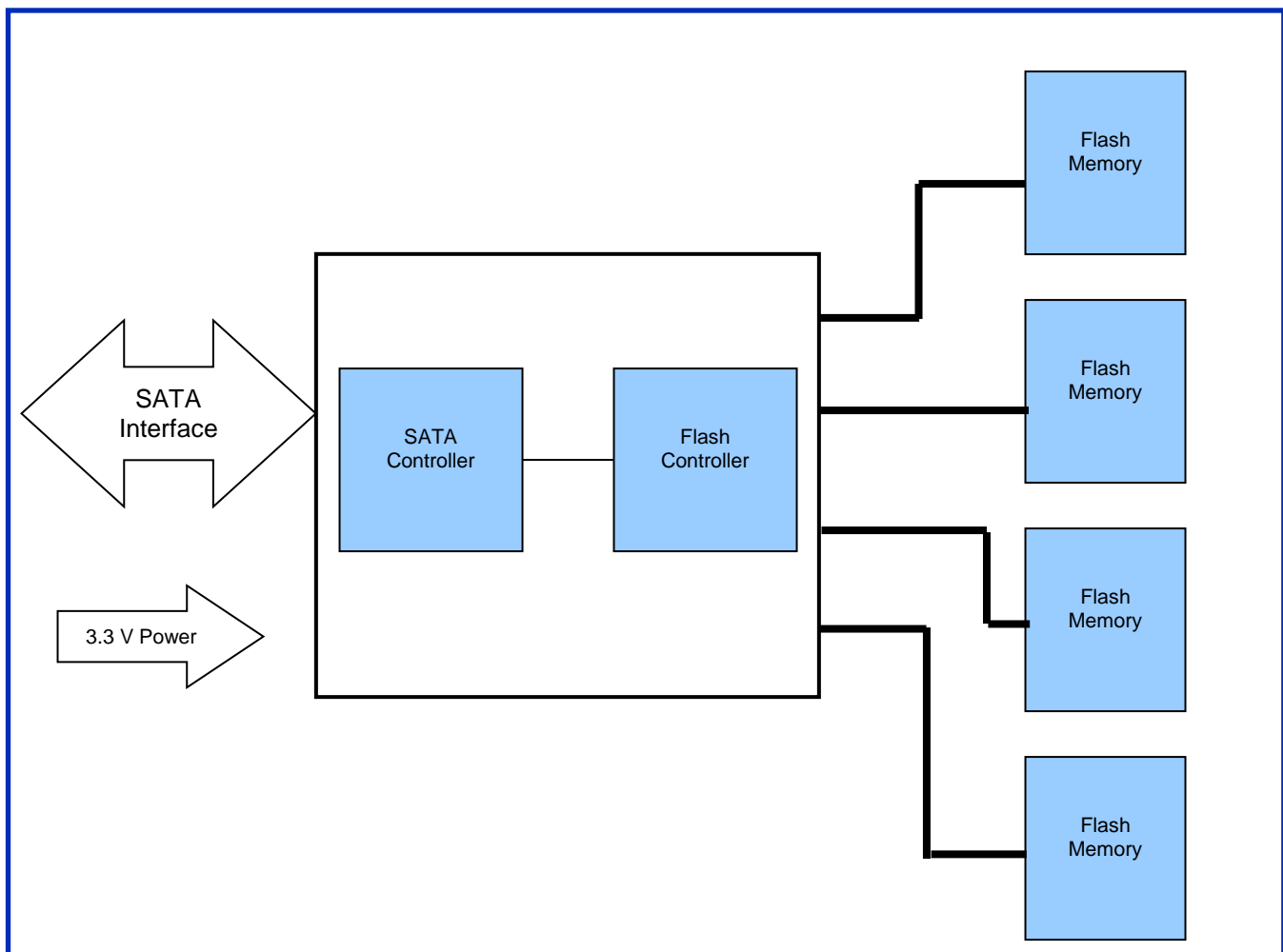
Parameter	Value
Length	42 mm [1.65in]
Width	22 mm [0.87in]
Height	3.5 mm [0.14in]

2. PRODUCT DESCRIPTION

The SMART M.2 SATA SSD contains a 6 Gb/sec SATA interface controller and a NAND flash controller with corresponding flash memory devices. This system architecture logically and efficiently translates standard SATA HDD commands into flash memory accesses. Parallel access to the flash memory allows overlapped, multi-block access to complete data transfer requests rapidly. Efficient local voltage converters provide the power for logic and memory from the standard SATA power connection using switching regulators to minimize wasted power.

2.1. Functional Block Diagram

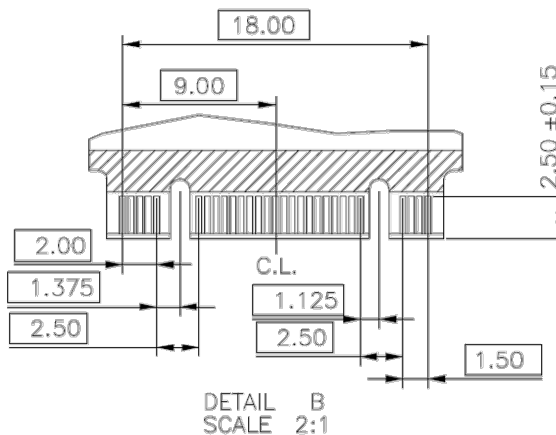
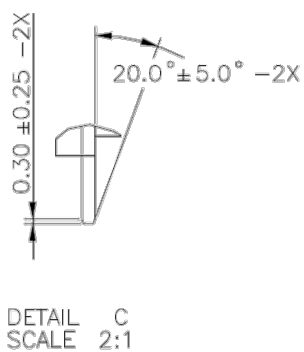
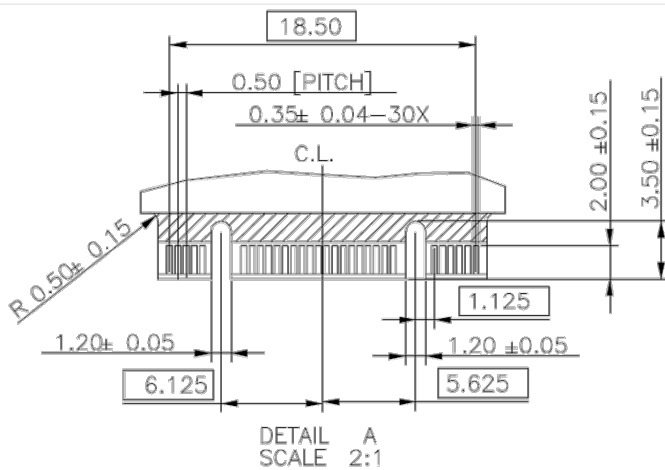
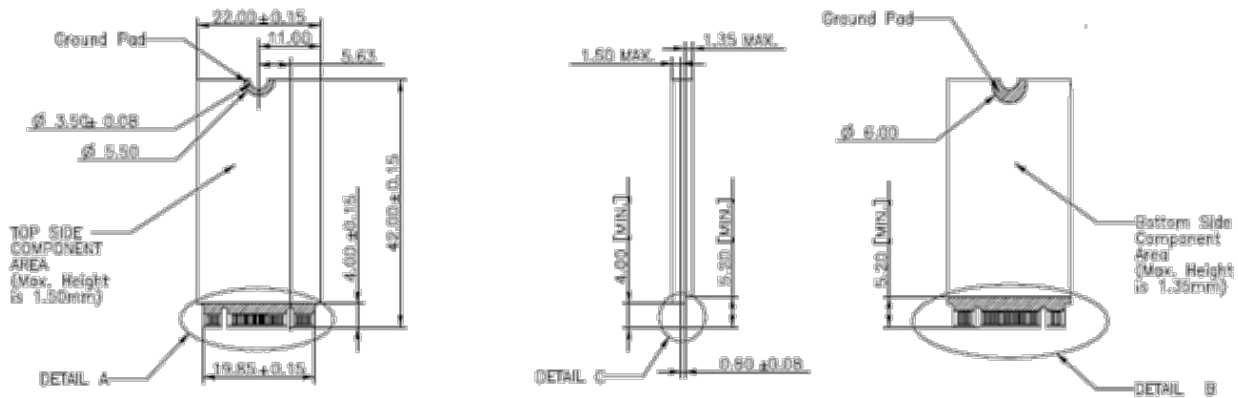
Figure 1: M.2 SATA SSD Block Diagram



2.2. Mechanical Specification

Conforms to PCI Express M.2 Specification, M.2 2242-D2-B-M

Figure 2. M.2 2242-D2-B-M Dimensions (in mm): 42 (L) x 22 (W) x 3.65 (H)



General tolerance: ± 0.15 mm

2.3. Endurance

- **Static & Dynamic Wear Leveling:** This feature eliminates overstressing flash media by spreading the data writes across all flash physical address space, including logical areas that are not written by the user. The data is wear leveled across the entire drive.
- **ECC:** utilize BCH ECC to provide correction of up to 43 random single-bit errors per 1 KByte block of user data.
- **Bad Block Management:** This feature tracks all manufacturing and run-time bad blocks of flash media and replaces them with new ones from the spare pool.

2.4. Mean Time Between Failures (MTBF)

MTBF can be calculated using Telcordia SR-232. issue 2 Parts count method.

Table 7: MTBF Values

Drive@50C	MTBF (Hours)
All Capacities	> 2,000,000

3. ELECTRICAL SPECIFICATION

3.1. Electrical Interface

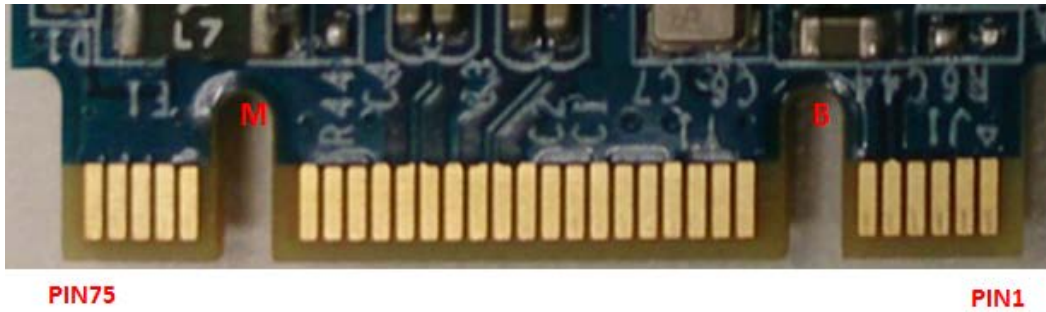
The M.2 SATA drive is compliant with the SATA III, 6.0 Gb/sec standard.

3.1.1. M.2 Dual Key B-M SATA Interface

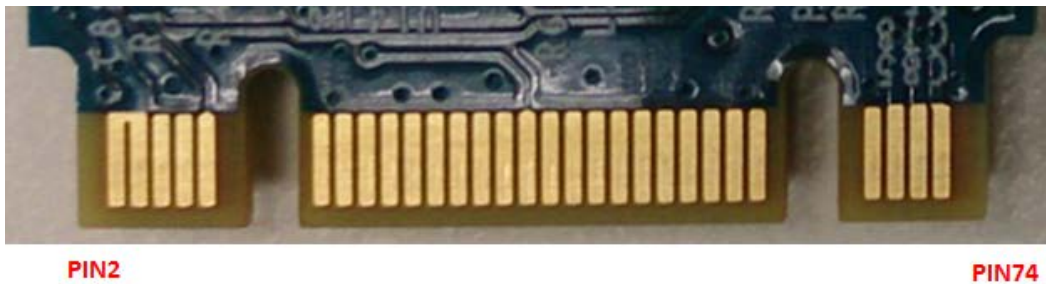
Figure 3 Shows the pin-outs for the M.2 SATA Drive

Figure 3. M.2 Dual Key B-M SATA Interface

Top View



Bottom View



3.1.2. Pinout Descriptions

Table 8: Pinout Descriptions

Pin	Signal Name	Signal Description
10	DAS/DSS# (IO)	Device Activity Signal / Disable Staggered Spinup
38	DEVSLP (I)	Reserved
41	SATA - B+	Receive +
43	SATA - B-	Receive -
47	SATA - A-	Transmit -
49	SATA - A+	Transmit +
56	Reserved for MFG_DATA	Vendor dependent manufacturing pin
58	Reserved for MFG_CLOCK	Vendor dependent manufacturing pin
68	SUSCLK(32kHz) (I)(0/3.3V)	Suspend Clock signal
69	PEDET (GND-SATA)	Protocol detect signal: SATA (low) / PCIe (high)
5, 6, 7, 8, 9, 11, 20, 22, 23, 24, 25, 26, 28, 29, 30, 31, 32, 34, 35, 36, 37, 40, 42, 44, 46, 48, 50, 52, 53, 54, 55, 67	N/C	Not Configured
2, 4, 70, 72, 74	V3.3	3.3 V power
1, 3, 21, 27, 33, 39, 45, 51, 57, 71, 73, 75	GND	Ground

3.2. Absolute Maximum Ratings

Table 10: Absolute Maximum Ratings*

Symbol	Parameter	Minimum Value	Maximum Value	Unit
V _{CC3}	3.3 V Supply Voltage	-0.3	3.6	V
V _{IN3}	3.3 V Input Voltage	GND - 0.2	V _{CC} + 0.2	V
I _{IN3}	3.3 V DC Input Current	333	522	mA
T _{STG}	Storage Temperature	-40	+85	°C

*Stress beyond the Absolute Maximum Rating conditions may result in permanent damage to the device. These are stress ratings only and functional operation should be restricted to those indicated in the operational sections of this specification. Exposure to conditions beyond recommended, up to and including the Absolute Maximum Rating conditions, for extended periods may affect device reliability.

3.3. Recommended Operating Conditions

Parameter	Ratings
3.3 V Supply Voltage	3.3V ± 5%
Operating Temperature - Commercial	0°C to +70°C

4. ATA COMMANDS

This section documents the host interface commands the M.2 SATA drive supports.

4.1. Supported ATA Commands

The M.2 SATA drive supports the standard commands listed in the table below. For more detailed descriptions of the commands, please refer to the ATA-8 specification.

Table 11: Supported ATA Commands

Command Name	Op Code (Hex)	Command Set (Category)
Check Power Mode	E5	PwrMgmt
	98	PwrMgmt
Data Set Management (Trim)	06	48-bit Address
Device Configuration Overlay	B1	DCO
Download Microcode	92	General
Execute Device Diagnostics	90	General
Flush Cache	E7	General
Flush Cache Ext	EA	48-bit Address
Identify Device	EC	General
Idle	E3	PwrMgmt
	97	PwrMgmt
Idle Immediate	E1	PwrMgmt
	95	PwrMgmt
Initialize Device Parameters	91	General
NOP	00	General
Read Buffer	E4	General
Read DMA	C8	General
Read DMA Ext	25	48-bit Address
Read FPDMA Queued	60	General
Read Log Ext	2F	48-bit Address
Read Multiple	C4	General
Read Multiple Ext	29	48-bit Address
Read Native Max Address	F8	HPA
Read Native Max Address Ext	27	48-bit Address
Read Sectors	20	General
Read Sectors Ext	24	48-bit Address
Read Verify Sectors	40	General
	41	General
Read Verify Sectors Ext	42	48-bit Address
Security Disable Password	F6	Security
Security Erase Prepare	F3	Security
Security Erase Unit	F4	Security
Security Freeze Lock	F5	Security
Security Unlock	F2	Security
Seek	70	General
Set Features	EF	General
Set Max Address	F9	HPA
Set Max Address Ext	37	48-bit Address
Set Max Set Password	F9	HPA
Set Max Lock	F9	HPA
Set Max Freeze Lock	F9	HPA

Table 11: Supported ATA Commands

Command Name	Op Code (Hex)	Command Set (Category)
Set Max Unlock	F9	HPA
Set Multiple Mode (Max = 1)	C6	General
Set Sleep Mode	E6	PwrMgmt
	99	PwrMgmt
Sleep	E6	PwrMgmt
S.M.A.R.T. Operations	B0	S.M.R.T
Standby	E2	PwrMgmt
Standby Immediate	E0	PwrMgmt
	94	PwrMgmt
Write Buffer	E8	General
Write DMA	CA	General
Write DMA Ext	35	48-bit Address
Write DMA FUA Ext	35	48-bit Address
Write FPDMA Queued	3D	General
Write Log Ext	61	48-bit Address
Write Multiple	C5	General
Write Multiple Ext	39	48-bit Address
Write Multiple FUA Ext	CE	48-bit Address
Write Sectors	30	General
Write Sectors Ext	34	48-bit Address
Write Verify	3C	General

4.2. Supported S.M.A.R.T. Operations

Self-monitoring analysis and reporting technology (S.M.A.R.T.) commands provide diagnostic information regarding drive operation and, in certain cases, can assist in predicting drive degradation. Because S.M.A.R.T. alerts the host of possible drive problems, users can assess the situation and back up data prior to an operational failure.

Each S.M.A.R.T. attribute monitors a specific drive condition, with threshold levels configured for select attributes. When the drive exceeds these thresholds, the S.M.A.R.T. attribute reports the condition. In many cases, exceeding the threshold simply indicates you should monitor the drive more closely. Host systems initiate commands, generated manually or with a third-party diagnostic tool, to monitor S.M.A.R.T. attributes.

Although the SATA Slim supports several S.M.A.R.T. operations, which are subcommands of the S.M.A.R.T. Operations command (see Table 12), the S.M.A.R.T. Return Status and S.M.A.R.T. Read Data subcommands are used for monitoring the drive.

Initiating a S.M.A.R.T. Return Status command returns the current state of the drive, specifying whether or not an attribute exceeded the assigned threshold. If an attribute has exceeded a threshold level, SMART Modular Technologies recommends issuing the S.M.A.R.T. Read Data command to identify the specific attribute (see Table 14).

S.M.A.R.T. commands are issued with B0h in the Command register and the code for the desired operation in the Features register. A S.M.A.R.T. Enable Operations must be issued before any other S.M.A.R.T. command can be performed.

4.2.1. Supported S.M.A.R.T. Subcommands

Table 12: Supported S.M.A.R.T. Subcommands

Subcommand Name	Feature Code (Hex)
S.M.A.R.T. Read Data	D0
S.M.A.R.T. Read Attribute Thresholds	D1 (obsolete)
S.M.A.R.T. Enable/Disable Autosave	D2
S.M.A.R.T. Save Attribute Values	D3 (obsolete)
S.M.A.R.T. Execute Off-Line Immediate	D4
S.M.A.R.T. Enable Operations	D8
S.M.A.R.T. Disable Operations	D9
S.M.A.R.T. Return Status	DA

4.2.2. Supported S.M.A.R.T. Data Structure

Table 13: Supported S.M.A.R.T. Data Structure

Byte	Description
0-1	Revision code
2-361	Vendor-specific
362	Offline data collection status
363	Self-test execution status byte
364-365	Total time in seconds to complete offline data collection activity
366	Vendor-specific
367	Offline data collection capability
368-369	S.M.A.R.T. capability
370	Error logging capability 7-1 Reserved 0 1 = Device error logging supported
371	Vendor-specific
372	Short self-test routine recommended polling time (in minutes)
373	Extended self-test routine recommended polling time (in minutes)
374	Conveyance self-test routine recommended polling time (in minutes)
386-395	Firmware version/data code
396-397	Number of initial invalid block (396 = MSB, 397 = LSB)
400-406	SMART
407-415	Vendor-specific
417	Program/write the strong page only
418-419	Number of spare blocks
446-510	Vendor-specific
511	Data structure checksum

4.2.3. Supported S.M.A.R.T. Attributes

Table 14: Support S.M.R.T. Attributes

Attribute Name	ID	Flags		Val	Worst	Raw Attribute Value							
	0	1	2	3	4	5	6	7	8	9	10	11	
Reported UECC Count	01h	0Ah	00h	Read Error Rate (1 ~100)	Read Error Rate (1 ~100)	Number of ECC Error					0	0	00h
Power On Hours	09h	12h	00h	64h	64h	Power-on Hours Count					0	0	00h
Power Cycle Count	0Ch	12h	00h	64h	64h	Power On/Off Cycles Count					0	0	00h
SATA PHY Error Count	A8h	12h	00h	64h	64h	SATA PHY Error Count					0	0	00h
Total Early Bad Block Count	AAh	13h	00h	64h	64h	Max Early Bad Block Count					0	0	0Ah
Max PE cycle Count (Block)	ADh	00h	00h	64h	64h	Average erase count	Max erase count				0	0	00h
Unexpected Power Loss Count	C0h	12h	00h	64h	64h	Unexpected Power Loss Count					0	0	00h
Total Later Bad Block Count	C4h	00h	00h	64h	64h	Total Later Bad Block Count					0	0	00h
CRC Error Count	DAh	0bh	00h	64h	64h	CRC Error Count					0	0	00h
Total Host Sectors Written	F1h	12h	00h	64h	64h	Host Write (MB)					00h		

4.3. Supported DCO Subcommands

Device Configuration Overlay (DCO) subcommands are issued with B1h in the Command register and the code for the desired command in the Feature register. See the following table for the supported subcommands and the corresponding Feature code.

Table 15: Supported DCO Subcommands

Subcommand Name	Code (Hex)
Device Configuration Freeze Lock	C1
Device Configuration Identify	C2
Device Configuration Restore	C0
Device Configuration Set	C3

4.4. Supported HPA Subcommands

Host Protected Area (HPA) subcommands are issued with F9h in the Command register and the code for the desired command in the Feature register. See the following table for the supported subcommands and the corresponding Feature code.

Table 16: Supported HPA Subcommands

Subcommand Name	Code (Hex)
Set Max Address	00
Set Max Freeze Lock	04
Set Max Lock	02
Set Max Set Password	01
Set Max Unlock	03

4.5. Identify Drive

This command passes to the Host one sector of data describing the Flash drive's parameters. The following table contains a detailed description of the Identify Drive data.

Table 17: Identify Device Information

Word	F: Fixed V: Variable X: Both	Default Value	Description
0	F	0040h	General configuration bit-significant information
1	X	*1	Obsolete – Number of logical cylinders
2	V	C837h	Specific configuration
3	X	0010h	Obsolete – Number of logical heads (16)
4-5	X	00000000h	Retired
6	X	003Fh	Obsolete – Number of logical sectors per logical track (63)
7-8	V	00000000h	Reserved for assignment by the Compact Flash Association
9	X	0000h	Retired
10-19	F	Varies	Serial number (20 ASCII characters)
20-21	X	0000h	Retired
22	X	0000h	Obsolete
23-26	F	Varies	Firmware revision (8 ASCII characters)
27-46	F	Varies	Model number (xxxxxxxx)
47	F	8010h	7:0- Maximum number of sectors transferred per interrupt on MULTIPLE commands
48	F	4000h	Trusted Computing feature set options(not support)
49	F	2F00h	Capabilities
50	F	4000h	Capabilities
51-52	X	000000000h	Obsolete
53	F	0007h	Words 88 and 70:64 valid
54	X	*1	Obsolete – Number of logical cylinders
55	X	0010h	Obsolete – Number of logical heads (16)
56	X	003Fh	Obsolete – Number of logical sectors per track (63)
57-58	X	*2	Obsolete – Current capacity in sectors
59	F	0110h	Number of sectors transferred per interrupt on MULTIPLE commands
60-61	F	*3	Maximum number of sector (28bit LBA mode)
62	X	0000h	Obsolete
63	F	0407h	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	Manufacturer's recommended Multiword DMA transfer cycle time
67	F	0078h	Minimum PIO transfer cycle time without flow control
68	F	0078h	Minimum PIO transfer cycle time with IORDY flow control
69	F	0100h	Additional Supported (support download microcode DMA)
70	F	0000h	Reserved

Table 17: Identify Device Information (continued)

Word	F: Fixed V: Variable X: Both	Default Value	Description
71-74	F	0000000000000000h	Reserved for the IDENTIFY PACKET DEVICE command
75	F	001Fh	Queue depth
76	F	670eh	Serial SATA capabilities
77	F	0084h	Serial ATA Additional Capabilities
78	F	014Ch	Serial ATA features supported
79	V	0040h	Serial ATA features enabled
80	F	07F8h	Major Version Number
81	F	0000h	Minor Version Number
82	F	346bh	Command set supported
83	F	7d09h	Command set supported
84	F	6063h	Command set/feature supported extension
85	V	3469h	Command set/feature enabled
86	V	bc01h	Command set/feature enabled
87	V	6063h	Command set/feature default
88	V	003Fh	Ultra DMA Modes
89	F	0001h	Time required for security erase unit completion
90	F	001Eh	Time required for Enhanced security erase completion
91	V	0000h	Current advanced power management value
92	V	FFFEh	Master Password Revision Code
93	F	0000h	Hardware reset result. The contents of the bits (12:0) of this word can be changed only during the execution of hardware reset.
94	V	0000h	Vendor's recommended and actual acoustic management value
95	F	0000h	Stream Minimum Request Size
96	V	0000h	Streaming Transfer Time – DMA
97	V	0000h	Streaming Access Latency – DMA and PIO
98-99	F	0000h	Streaming Performance Granularity
100-103	V	*4	Maximum user LBA for 48 bit Address feature set
104	V	0000h	Streaming Transfer Time – PIO
105	F	0008h	Maximum number of 512-byte blocks per DATA SET MANAGEMENT command
106	F	4000h	Physical sector size/Logical sector size
107	F	0000h	Inter-seek delay for ISO-7779 acoustic testing in microseconds
108-111	F	0000000000000000h	Unique ID
112-115	F	0000000000000000h	Reserved
116	V	0000h	Reserved
117-118	F	00000000h	Words per logical Sector
119	F	4014h	Supported settings

Table 17: Identify Device Information (continued)

Word	F: Fixed V: Variable X: Both	Default Value	Description
120	F	4014h	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
129-140	X	0h	Vendor specific
141	X	0001h	Vendor specific
142-159	X	0h	Vendor specific
160	F	0h	Compact Flash Association (CFA) power mode 1
161-167	X	0h	Reserved for assignment by the CFA
168	F	3h 2.5 inch 4h 1.8 inch 5h Less than 1.8 inch	Device Nominal Form Factor
169	F	0001h	DATA SET MANAGEMENT command is supported
170-173	F	0h	Additional Product Identifier
174-175		0h	Reserve
176-205	V	0h	Current media serial number
206	F	0h	SCT Command Transport
207-208	F	0h	Reserved
209	F	4000h	Alignment of logical blocks within a physical block
210-211	V	0000h	Write-Read-Verify Sector Count Mode 3 (not support)
212-213	F	0000h	Write-Read-Verify Sector Count Mode 2 (not support)
214-216		0000h	NV Cache relate (not support)
217	F	0001h	Non-rotating media device
218	F	0h	Reserved
219	F	0h	NV Cache relate (not support)
220	V	0h	Write read verify feature set current mode
221		0h	Reserved
222	F	107Fh	Transport major version number
223	F	0h	Transport minor version number
224-229		0h	reserved
230-233		0h	Extend number of user addressable sectors
234		0001h	Minimum number of 512-byte data blocks per DOWNLOAD MICROCODE command for mode 03h
235		0080h	Maximum number of 512-byte data blocks per DOWNLOAD MICROCODE command for mode 03h
236-254	F	0h	Reserved
255	X	XXA5h XX is variable	Integrity word (Checksum and Signature)

Table 18: Device Identification by Capacity

Capacity (GB)	*1 (Word 1/Word 54)	*2 (Word 57 - 58)	*3 (Word 60 - 61)	*4 (Word 100 - 103)
8	3CA5h	EEC9B0h	EEC9B0h	EEC9B0h
16	3FFFh	FBFC10h	1DD40B0h	1DD40B0h
32	3FFFh	FBFC10h	3BA2EB0h	3BA2EB0h
64	3FFFh	FBFC10h	7740AB0h	7740AB0h
128	3FFFh	FBFC10h	EE7C2B0h	EE7C2B0h

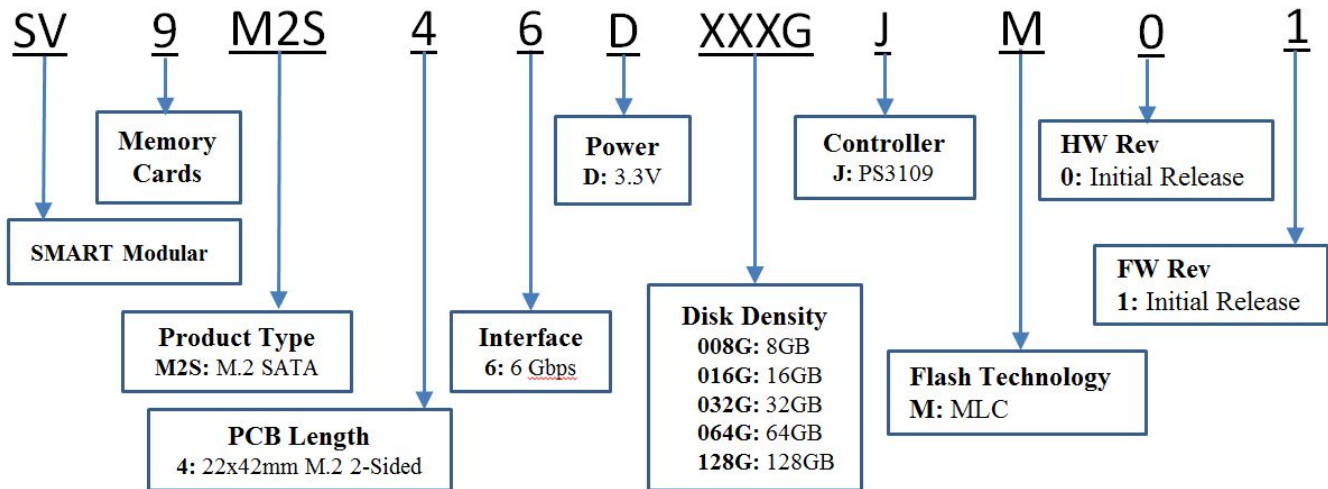
5. PART NUMBERS

5.1. Part Numbering Information

Table 14: Part Numbering Information

SMART Part Number	Capacity
SV9M2S46D008GJM01	8 GBytes
SV9M2S46D016GJM01	16 GBytes
SV9M2S46D032GJM01	32 GBytes
SV9M2S46D064GJM01 (TSOP)	64 GBytes
SV9M2S46D064GJM12 (BGA)	64 GBytes
SV9M2S46D128GJM01	128 GBytes

5.2. Part Number Decoder



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