SUPERTALENT MSATA SJ2 DATASHEET

MO-300 SATA-III SOLID STATE DRIVE

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1.0 PRODUCT DESCRIPTION

1.1 PRODUCT OVERVIEW

The introduction of the mSATA SJ2 is full consists of semiconductor devices using NAND flash memory which provide high reliability and high performance for a storage media. And opens up some very exciting possibilities for the Industrial and Commercial storage market. The mSATA SJ2 are substantially smaller, lighter weight and consume less power compared to hard drives, yet have sufficient storage space to load an O/S and serve as a bootable drive for embedded applications. Moreover, these devices have excellent resistance to shock, vibration, dust, temperature extremes and other environmental hazards.

mSATA SJ2 which features outstanding performance. Available in 16GB to 256GB capacities, this drives electrically complied with the SATA-II/SATA-III standards and is electrically compatible with a serial ATA disk drive. The transmission speed of up to 480MB/s.

Measuring 50.80mm x 29 .85mm x 3.50mm, the mSATA SJ2 is very small in volume and Super Speed, it can match and satisfy different customer‘s demand. It can easily mount on notebook without any cable, and provides fast read and writes speed, high reliability it an ideal storage solution for the server and mobile environment.

1.2 TARGET APPLICATIONS

- Military and Aerospace
- Embedded / Industrial Systems
- Medical Industry
- Notebook
- Casino Gaming

1.3 PRODUCT FEATURES

- Capacity: 16GB ,32GB, 64GB, 128GB ,256GB
- Form Factor: mini PCIe (50.80mm x 29 .85mm x 3.50mm)
- Reliable MLC or SLC NAND type flash
- Electrically fully complied with the SATA-II/SATA-III standards
- Data retention: JESD47 compliant
- S.M.A.R.T. command transport (SCT) technology
- Enhanced endurance by dynamic/static wear-leveling.
- Hardware BCH ECC 66bits in 1,024 bytes.
- Data integrity under power-cycling.

- Spec meet JEDEC MO-300.
- 100% tested HW and SW.

1.4 SYSTEM REQUIREMENTS

Operating Voltage Requirement: V_{cc} = 3.3V +/-5%

Operating System: Supported by all operating systems

Interface: SATA 3.0Gbps (SATA-II), SATA 6.0Gbps (SATA-III)

Installation Requirements:

- System Hardware which supports SATA-II/SATA-III standards
- System Hardware includes mSATA socket or transfer board

2.0 PRODUCT ORDERING PART NUMBERS

2.1 ORDERING PART STRUCTURE

Table 1: Ordering Part Structure

	Product Type X	Density XXX	Technology XX	Form & Case Factor XX
F – Channel	MD – mSATA SLC Full Size 30x50	016 – 16GB	MT – SM2246XT SATA 3.0 (no DRAM) 4CH	RM – Board Only
	M5 – mSATA MLC Full Size 30x50	032 – 32GB		
		064 – 64GB		
		128 – 128GB		
		256 – 256GB		

2.2 VALID ORDERING PART NUMBERS

Table 2: Valid Ordering Part Numbers

Product Family	Capacity	Flash	Mode	Encryption	Channel/Retail Part Number
mSATA SJ2	16GB	SLC	Commercial		FMD016MTRM
		MLC	Commercial		FM5016MTRM
	32GB	SLC	Commercial		FMD032MTRM
		MLC	Commercial		FM5032MTRM
	64GB	SLC	Commercial		FMD064MTRM
		MLC	Commercial		FM5064MTRM
	128GB	MLC	Commercial		FM5128MTRM
	256GB	MLC	Commercial		FM5256MTRM

3.0 PHYSICAL SPECIFICATIONS

3.1 MECHANICAL SPECIFICATIONS (PCBA)

Length: 50.80 ± 0.25 mm

Width: 29.85± 0.25 mm

Thickness: 3.50 ± 0.25 mm

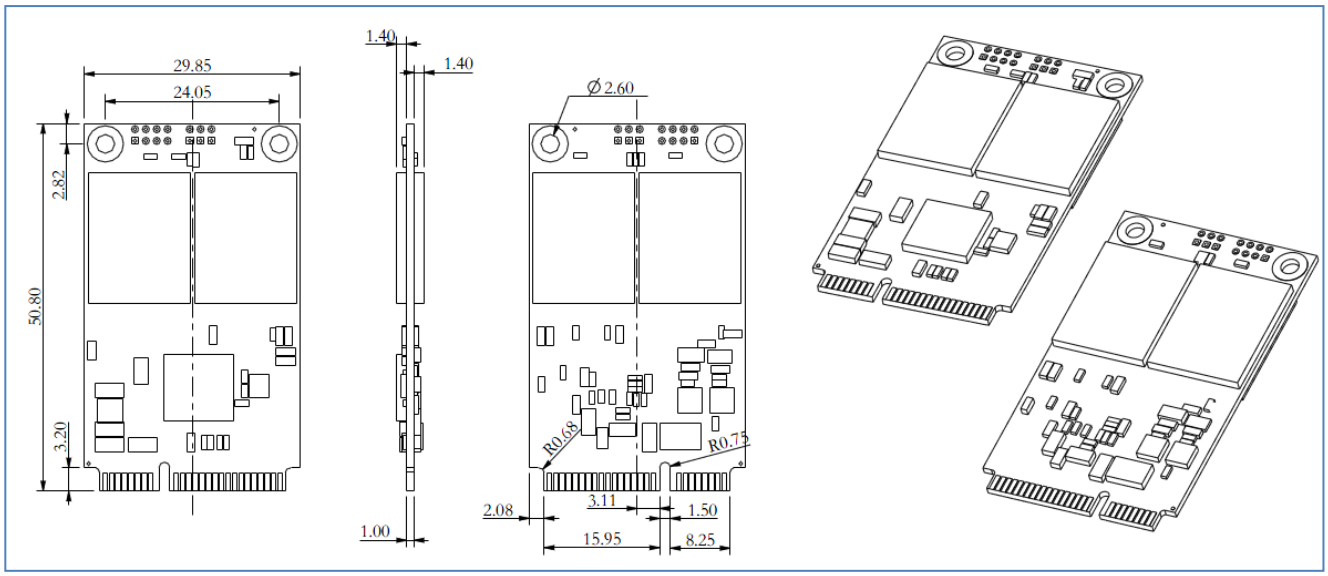

Figure 1: Outline Drawing

4.0 ELECTRICAL SPECIFICATIONS

Operating Voltage: V_{cc} = 3.3V ±5%

Modes: SATA 3.0Gbps (SATA-II), SATA 6.0Gbps (SATA-III)

4.1 PERFORMANCE SPECIFICATIONS

Access Time: 0.2 ms

Seek Time: 0 ms

Power on to Ready: Dependent on system HW and SW

Mount Time: The mount time for initializing and mounting the mSATA SJ2 depends on the O/S and testing platform.

Data Transfer Time:

Table 3: Data Transfer Time Specifications

Device	Sequential Read Max (MB/Sec) *	Sequential Write Max (MB/Sec) *
FM5032JMRM	357 MB/s	53 MB/s
FM5064JMRM	410 MB/s	88 MB/s
FM5128JMRM	480 MB/s	165 MB/s
FM5256JMRM	480 MB/s	236 MB/s

4.2 POWER AND TEMPERATURE CONDITIONS

Table 4: Absolute Maximum Ratings

Symbol	Rating	Value	Unit
V_{cc}	Power Supply Voltage	-0.3 to 3.6	V
V_{IN}	Input Voltage	-0.5 to Vcc +0.5	V
T_{STG}	Storage Temperature	-55 to +115	°C
T_{OPR}	Commercial Grade	0 to +70	°C

4.3 POWER CONSUMPTION TEST FOR RESULT

Table 5: Power Consumption Test For Result

Test software: Crystal Disk Mark3.0					
Times		1	2	3	Power（W=U*I）
Static current(Idle mode current)		100mA	100mA	100mA	3.3V*0.100A=0.330W
Dynamic current (R/W mode current)	Seq read	340mA	340mA	340mA	3.3V*0.340A=1.122W
	Seq write	180mA	180mA	180mA	3.3V*0.180A=0.594W
	512K read	280mA	280mA	280mA	3.3V*0.280A=0.924W
	512K write	380mA	380mA	380mA	3.3V*0.380A=1.254W
	4K read	170mA	170mA	170mA	3.3V*0.155A=0.561W
	4K write	240mA	240mA	240mA	3.3V*0.247A=0.792W
	4K QD32 read	170mA	170mA	170mA	3.3V*0.155A=0.561W
	4K QD32 write	240mA	240mA	240mA	3.3V*0.247A=0.792W

5.0 ENVIRONMENTAL SPECIFICATIONS

Operating Temperature:

Commercial Grade: 0°C to +70°C

Humidity: 5% to ~98% RH

Operating Shock: 1500G

Operating Vibration: 16G

Operating Altitude: TBD

6.0 QUALITY AND RELIABILITY SPECIFICATIONS

Data Retention: JESD47 compliant

Wear Leveling: Dynamic and static wear-leveling

Bad Block Management: Drive will self identify bad blocks and remap physical to logical addresses to avoid bad blocks.

ECC/EDC (Error Correction Code/Error Detection Code): Built in error detection and correction will correct physical bit errors in NAND. Drives use BCH 66 bits ECC

MTBF: >1,000,000 hours

Power Cycle:

Table 6: Compatibility Test Config

Test Platform: Compatibility Test Config				
Test Items	Total Times	PASS Times	Fail Times	Log Photo
Cycles	1000 times	1000 times	0 times	
Suspend	1000 times	1000 times	0 times	

7.0 COMPLIANCE SPECIFICATIONS

All mSATA SJ2 are compliant with the following standards and regulations:

- RoHS
- CE
- FCC

8.0 PIN DESCRIPTIONS

8.1 MINI SATA INTERFACE DRAWING

Interface Description (mSATA)

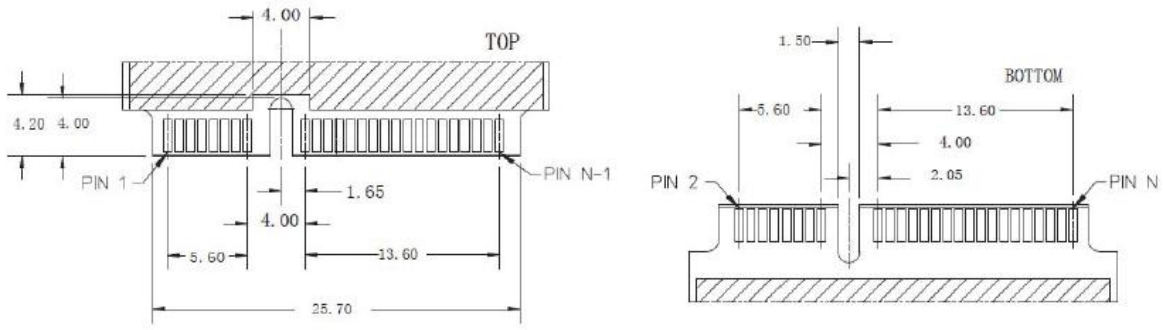

Figure 2: Interface Description

8.2 PIN SIGNALS ASSIGNMENTS

Table 7: Pin Assignment

Pin	Signal Name	Description	Pin	Signal Name	Description
1	Reserved	NC	2	+3.3V	3.3V Power (Source)
3	Reserved	NC	4	GND	Return Current Path
5	Reserved	NC	6	VCC1.5	NC
7	Reserved	NC	8	Reserved	NC
9	GND	Return Current Path	10	Reserved	NC
11	Reserved	NC	12	Reserved	NC
13	Reserved	NC	14	Reserved	NC
15	GND	Return Current Path	16	Reserved	NC
17	Reserved	NC	18	GND	Return Current Path
19	Reserved	NC	20	Reserved	NC
21	GND	Return Current Path	22	Reserved	NC
23	TX+	SATA transmitter differential pair	24	+3.3V	VAUX3.3
25	TX-		26	GND	Return Current Path
27	GND	Return Current Path	28	VCC1.5	NC
29	GND	Return Current Path	30	SMB_CLK	NC
31	RX-	SATA receiver differential pair	32	SMB_DATA	NC
33	RX+		34	GND	Return Current Path
35	GND	Return Current Path	36	USB_DN	NC
37	GND	Ground 1st mate	38	USB_DP	NC
39	+3.3V	3.3V Power (Source)	40	GND	Return Current Path
41	+3.3V	3.3V Power (Source)	42	Reserved	NC
43	Device Type	Return Current Path/NC	44	Devslp	Device Sleep Mode
45	Reserved	FORCE-ROM（TX）/NC	46	Reserved	NC
47	Reserved	SATA LED （RX）/NC	48	VCC1.5	NC
49	DA/DSS	Device Activity Signal	50	GND	Return Current Path
51	GND	Return Current Path	52	+3.3V	3.3V Power (Source)

9.0 SUPPORTED ATA COMMAND SET

9.1 ATA COMMAND REGISTER

mSATA SJ2 supports the command show in the following tables.

Table 8: Command Set

Command Name	Code (Hex)	Protocol
General Feature Set		
Execute Device Diagnostic	90h	Execute device diagnostic

Command Name	Code (Hex)	Protocol
Flush Cache	E7h	Non-data
Identify Device	ECh	PIO data-in
Initialize Drive Parameters	91h	Non-data
Read DMA	C8h	DMA
Read Log Ext	2Fh	PIO data-in
Read Multiple	C4h	PIO data-in
Read Sector(s)	20h	PIO data-in
Read Verify Sector(s)	40h or 41h	Non-data
Set Feature	EFh	Non-data
Set Multiple Mode	C6h	Non-data
Write DMA	CAh	DMA
Write Multiple	C5h	PIO data-out
Write Sector(s)	30h	PIO data-out
NOP	00h	Non-data
Read Buffer	E4h	PIO data-in
Write Buffer	E8h	PIO data-out
Power Management Feature Set		
Check Power Mode	E5h or 98h	Non-data
Idle	E3h or 97h	Non-data
Idle Immediate	E1h or 95h	Non-data
Sleep	E6h or 99h	Non-data
Standby	E2h or 96h	Non-data
Standby Immediate	E0h or 94h	Non-data
Security Mode Feature Set		
Security Set Password	F1h	PIO data-out
Security Unlock	F2h	PIO data-out
Security Erase Prepare	F3h	Non-data
Security Erase Unit	F4h	PIO data-out
Security Freeze Lock	F5h	Non-data
Security Disable Password	F6h	PIO data-out
SMART Feature Set		
SMART Disable Operations	B0h	Non-data
SMART Enable/Disable Autosave	B0h	Non-data
SMART Enable Operations	B0h	Non-data
SMART Execute OFF-LINE Immediate	B0h	Non-data
SMART Read Log	B0h	PIO data-in
SMART Read Data	B0h	PIO data-in
SMART Read Threshold	B0h	PIO data-in
SMART Return Status	B0h	Non-data
SMART Save Attribute Values	B0h	Non-data
SMART Write Log	B0h	PIO data-out
Host Protected Area Feature Set		

Command Name	Code (Hex)	Protocol
Read Native Max Address	F8h	Non-data
Set Max Address	F9h	Non-data
Set Max Set Password	F9h	PIO data-out
Set Max Lock	F9h	Non-data
Set Max Freeze Lock	F9h	Non-data
Set Max Unlock	F9h	PIO data-out
48-bit Address Feature Set		
Flush Cache Ext	EAh	Non-data
Read Sector(s) Ext	24h	PIO data-out
Read DMA Ext	25h	DMA
Read Multiple Ext	29h	PIO data-out
Read Native Max Address Ext	27h	Non-data
Read Verify Sector(s) Ext	42h	Non-data
Set Max Address Ext	37h	Non-data
Write DMA Ext	35h	DMA
Write Multiple Ext	39h	PIO data-out
Write Sector(s) Ext	34h	PIO data-out
NCQ Feature Set		
Read FPDMA Queued	60h	DMA Queued
Write FPDMA Queued	61h	DMA Queued
Others		
Data Set Management	06h	DMA
Seek	70h	Non-data

Table 9: Set Features Register Values

Value	Command	Value	Command
D0h	Read Data	D5h	Read Log
D1h	Read Attribute Threshold	D6h	Write Log
D2h	Enable/Disable Autosave	D8h	Enable SMART Operations
D3h	Save Attribute Values	D9h	Disable SMART Operations
D4h	Execute OFF-LINE Immediate	DAh	Return Status

Note: If the reserved size is below the threshold, the status can be read from the Cylinder Register using the Return Status command (DAh).

9.2 IDENTIFY DEVICE COMMAND INFORMATION

Table 10: Identify Device Command Definition Abbreviation Decoder

Parameter	Definition
F/V	Fixed/Variable Content
F	Content (byte) is fixed and does not change.

V	Content (byte) is variable and may change depending on the state of the device or the commands executed by the device.
X	Content (byte) is vendor specific and may be fixed or variable.

Table 11: Identify Device Table Information

Word	Value	F/V	Description
0	044Ah	F	General configuration
1	XXXXh	X	Default number of cylinders
2	0000h	V	Reserved
3	00XXh	X	Default number of heads
4	0000h	X	Obsolete
5	0240h	X	Obsolete
6	XXXXh	F	Default number of sectors per track
7-8	XXXXh	V	Number of sectors per card (Word 7 = MSW, Word 8 = LSW)
9	0000h	X	Obsolete
10-19	XXXXh	F	Serial number in ASCII (Right justified)
20	0002h	X	Obsolete
21	0002h	X	Obsolete
22	0000h	X	Obsolete
23-26	XXXXh	F	Firmware revision in ASCII Big Endian Byte Order in Word
27-46	XXXXh	F	Model number in ASCII (Left justified) Big Endian Byte Order in Word
47	8001h	F	Maximum number of sectors on Read/Write Multiple command
48	0000h	F	Reserved
49	0300h	F	Capabilities
50	4000h	F	Capabilities
51	0200h	F	PIO data transfer cycle timing mode
52	0000h	X	Obsolete
53	0007h	F	Field validity
54	XXXXh	X	Current numbers of cylinders
55	XXXXh	X	Current numbers of heads
56	XXXXh	X	Current sectors per track
57-58	XXXXh	X	Current capacity in sectors (LBAs) (Word 57 = LSW , Word 58 = MSW)
59	0101h	F	Multiple sector setting
60-61	XXXXh	F	Total number of user addressable logical sectors for 28-bit commands (DWord)
62	0000h	X	Reserved
63	0207h	F	Multiword DMA transfer Supports MDMA mode 0, 1 and 2

Word	Value	F/V	Description
64	0003h	F	Advanced PIO modes supported
65	0078h	F	Minimum Multiword DMA transfer cycle time per word
66	0078h	F	Recommended Multiword DMA transfer cycle time
67	0078h	F	Minimum PIO transfer cycle time without flow control
68	0078h	F	Minimum PIO transfer cycle time with lORDY flow control
69	4000h	F	Additional supported
70-74	0000h	F	Reserved
75	001Fh	F	Queue depth
76	030Eh	F	Serial ATA capabilities • Supports Serial ATA Gen3 • Supports Serial ATA Gen2 • Supports Serial ATA Gen1 • Supports Phy event counters log • Supports receipt of host initiated power management requests • Supports Native Command Queuing
77	0080h	F	Serial ATA additional capability • DevSleep_to_ReducedPwerState
78	0148h	F	Serial ATA features supported • Supports Device Sleep • Supports • Software settings preservation • Device supports initiating power management
79	0040h	V	Reserved
80	03FCh	F	Major version number (ACS-2)
81	0000h	F	Minor version number
82	702Bh	F	Command sets supported 0
83	7500h	F	Command sets supported 1
84	4002h	F	Command sets supported 2
85-87	XXXXh	V	Command set/feature enabled
88	007Fh	V	Ultra DMA mode supported and selected
89	0003h	F	Time required for a Normal Erase mode Security Erase Unit command
90	0001h	F	Time required for an Enhanced Erase mode Security Erase Unit command
91	0000h	V	Current advanced power management value
92	FFFEh	V	Master password identifier
93-99	0000h	V	Reserved
100-103	XXXXh	V	Maximum user LBA for 48-bit address feature set
104	0000h	V	Reserved
105	0100h	F	Maximum number of 512-byte blocks per Data Set Management command
106-127	0000h	V	Reserved
128	0009h	V	Security status
129-159	XXXXh	X	Vendor specific
160	0000h	F	CFA power mode

Word	Value	F/V	Description
161	0000h	X	Reserved
162	0000h	F	Key management schemes supported
163	0000h	F	CF Advanced True IDE Timing mode capability and setting
164-168	0000h	V	Reserved
169	0001h	F	Data Set Management supported
170-216	XXXXh	V	Reserved
217	0001h	F	Non-rotating media (SSD)
218-221	0000h	X	Reserved
222	107Fh	F	Transport major revision (SATA Rev 3.1)
223-254	0000h	X	Reserved
255	XXXXh	X	Integrity word

9.3 SUPPORTED IDENTIFY DEVICE COMMAND INFORMATION DEFINITIONS

Table 12: SMART Data Vendor-specific Attributes

Attribute ID(Hex)	Raw Attribute Value						Attribute Name
01	MSB	00	00	00	00	00	**Read error rate**
05	LSB	MSB	00	00	00	00	**Reallocated sectors count**
09	LSB			MSB	00	00	**Reserved**
0C	LSB			MSB	00	00	**Power cycle count**
A0	LSB			MSB	00	00	**Uncorrectable sector count when read/write**
A1	LSB	MSB	00	00	00	00	**Number of valid spare block**
A2	LSB	MSB	00	00	00	00	**Number of cache data block**
A3	LSB	MSB	00	00	00	00	**Number of initial invalid block**
A4	LSB			MSB	00	00	**Total erase count**
A5	LSB			MSB	00	00	**Maximum erase count**
A6	LSB			MSB	00	00	**Minimum erase count**
A7	LSB			MSB	00	00	**Average erase count**
C0	LSB				MSB	00	**Power-off retract count**
C2	MSB	00	00	00	00	00	**Controlled temperature**
C3	LSB			MSB	00	00	**Hardware ECC recovered**
C4	LSB			MSB	00	00	**Reallocation event count**
C7	LSB	MSB	00	00	00	00	**UltraDMA CRC error count**
F1	LSB			MSB	00	00	**Total LBAs written (each write unit=32MB)**
F2	LSB			MSB	00	00	**Total LBAs read (each read unit=32MB)**

10 INSTALLATION

10.1 BEFORE GETTING STARTED

BACK UP YOUR DATA

- Back up your Data

VISUAL INSPECTION

- Before unpacking and handling the SSD, discharge the static electricity by touching the metal chassis of your computer or by using an anti-static wrist strap.
- Inspect the box and device for the following:

  Box is damaged or water-stained

  Any damage to the SSD

10.2 INSTALLATION

SYSTEM REQUIREMENTS

- Install the SSD in your computer; ensure that you have the following item

  mSATA socket or transfer board

  Mounting screws

VISUAL INSPECTION

- The SSD can be installed in mSATA socket or transfer board for your computer.

INSTALL THE SSD

Follow these steps to install the SSD

- Power down the PC
- Remove the computer system outside cover
- The SSD is plugged into the host
- Replace the PC cover
- Power on the PC
- A BIOS sign-on message appears and displays a key sequence to enter the BIOS setup. Set up the BIOS to recognize the SSD.
- Installation is complete

10.3 USING THE SSD

HANDLING THE SSD

Be cautious when unpacking, installing, and handling the SSD drive. Misuse of the SSD voids all warranty. Follow the succeeding instructions when managing the SSD

Follow all ESD pre-cautions always operate the SSD within environmental conditions never switch DC power to the drive by plugging and Ensure correct interface polarity whenever plugged into the drive

FOR MORE INFORMATION

For Technical Support:

If additional support is needed, please visit the Super Talent Web site at www.supertalent.com for the following topics:

- **Warranty Services:** Includes the warranty service policy and the RMA request forms.
- **Technical Information:** Includes product data sheets and various USB whitepapers.
- **Tools Section:** Includes frequently asked questions (FAQs).

For More Information or Further Technical Support Please Contact:

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CHANGE RECORD

Table 13: Change Record

Version	Release Date	Changes
1.0	November 21st , 2014	Initial Release in new template