



Industrial M.2 2242 Specification

(INSPIRE Series, 3D TLC)

Version 1.5

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1. GENERAL DESCRIPTION



1.1. Introduction

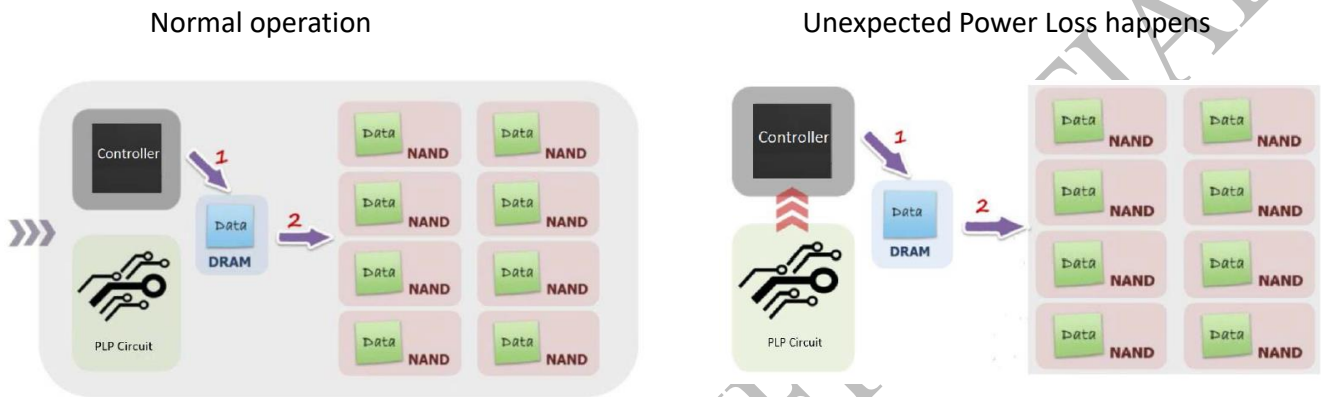
FLEXXON's INSPIRE M.2 2242 has SATA III interface, and is fully compliant with standard Next Generation Form Factor (NGFF) called M.2 Card Format. It supports high performance, high endurance, good compatibility and provides comprehensive data protection. It is suitable for multi-tasking application.

1.2. Product Overview

- ❖ **Flash**
 - 3D TLC
- ❖ **Capacity**
 - 32GB up to 1TB
- ❖ **SATA Interface**
 - Compliant with SATA Revision 3.2
 - Compatible with SATA 1.5Gbps, 3Gbps and 6Gbps interface
- ❖ **ECC Scheme**
 - INSPIRE M.2 2242 applies the LDPC (Low Density Parity Check) of ECC algorithm
- ❖ **UART Function**
- ❖ **GPIO**
- ❖ **Support SMART and TRIM commands**
- ❖ **Support DDR3/DDR3L External DRAM**
- ❖ **Low Power Management**
- ❖ **Power Failure Protection**
- ❖ **Data shaping technique for enhanced data endurance**
- ❖ **Data Refresh technology for data integrity**
- ❖ **Global Wear Levelling Algorithm**
- ❖ **AES256 and TCG OPAL (Optional)**
- ❖ **Temperature Range**
 - Operation (Silver) : 0°C ~ 70°C
 - Operation (Diamond) : -40°C ~ 85°C
 - Storage: -55°C ~ 95°C
- ❖ **RoHS Compliant**

1.3. Power Loss Protection (Optional)

FLEXXON designs SSD device with a hardware power loss protection mechanism. It has a voltage drop detector, so when the SSD device detects the host power dropping, the SSD's power loss protection circuit will be triggered and begin providing power to the SSD. The SSD then will start to flush cached data from DRAM memory to NAND flash memory in order to preserve data integrity and prevent data loss.



The SSD is powered by the host power, and the power loss protection circuit is charged by the host power.

When the SSD detects the host power dropping, the power loss protection circuit starts to provide power to the SSD while it flushes cached data from DRAM to NAND.

Figure 1-power loss protection mechanism

2. PRODUCT SPECIFICATIONS



2.1. Performance

Table 2-1 Performance of INSPIRE M.2 2242

Capacity	Sequential		Random	
	Read (MB/s)	Write (MB/s)	Read (IOPS)	Write (IOPS)
30/32GB	279	103	20782	19956
60/64GB	390	242	29907	30933
120/128GB	475	394	50977	46655
240/256GB	549	481	91064	77832
480/512GB	553	502	83594	81079
960GB/1TB	558	505	122568	104775

NOTES:

1. The performance was measured using CrystalDiskMark v5.0x64 with SATA 6Gbps host.
2. Performance may differ according to flash configuration and platform.

2.2. Power

Table 2-2 Supply Voltage of INSPIRE M.2 2242

Parameter	Rating
Operating Voltage	3.3V +/-5%

Table 2-3 Power Consumption of INSPIRE M.2 2242

Parameter	Power Consumption
Idle (Max.)	0.415W
Active (Max.)	2.362W

NOTE:

1. Power Consumption may differ from flash configuration and platform.

2.3. TBW (Terabytes Written)

Capacity	TBW
32GB	49
64GB	95
128GB	191
256GB	384
512GB	769
1TB	1535

NOTES:

1. TBW may differ according to flash configuration and platform.
2. Samples were tested under JESD218A endurance test method and JESD219A endurance workloads specification.

2.4. MTBF

MTBF, an acronym for Mean Time Between Failures, is a measure of a device's reliability. Its value represents the average time between a repair and the next failure. The predicted result of FLEXXON's INSPIRE M.2 2242 is more than 2 million hours.

2.5. Data Retention

- 10 years if > 90% life remaining (@25C)
- 1 year if < 10% life remaining (@25C)

3. ENVIRONMENTAL SPECIFICATIONS



Test Items	Test Conditions
Storage Temperature	-55°C ~ 95°C
Operating Temperature	Silver Grade: 0°C ~ 70°C Diamond Grade: -40°C ~ 85°C
Storage Humidity	Silver Grade: 40°C, 95% RH Diamond Grade: 55°C, 95% RH
Operating Humidity	Silver Grade: 40°C, 93% RH Diamond Grade: 55°C, 95% RH
Shock	1500G, Half Sin Pulse Duration 0.5ms
Vibration	80Hz ~ 2000Hz/20G, 20Hz ~ 80Hz/1.52mm, 3 axis/60min
Drop	80cm free fall, 6 face of each unit
Bending	≥ 20N, Hold 1 min/5 times
ESD	24°C, 49% RH, +/-4KV

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4. ATA COMMANDS



Table 4-1 Supported ATA Command Set

#	Command	Code	Protocol
General Feature Set			
	Execute Drive Diagnostic	90h	Device diagnostic
	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 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
Host Protected Area Feature Set		
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-in
Read DMA Ext	25h	DMA
Read Multiple Ext	29h	PIO data-in
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

5. PIN ASSIGNMENT



Table 5-1 Pin Assignment and Description of INSPIRE M.2 2242

Pin #	SATA Pin	Description
1	CONFIG_3 = GND	Ground
2	3.3V	Supply pin
3	GND	Ground
4	3.3V	Supply pin
5	N/C	No Connect
6	N/C	No Connect
7	N/C	No Connect
8	N/C	No Connect
9	N/C	No Connect
10	DAS/DSS# (I/O)	Status indicators via LED devices that will be provided by the system Active Low. A pulled-up LED with series current limiting resistor should allow for 9mA when On.
11	N/C	No Connect
12	Module Key	
13	Module Key	
14	Module Key	
15	Module Key	
16	Module Key	
17	Module Key	
18	Module Key	
19	Module Key	
20	N/C	No Connect
21	CONFIG_0 = GND	Ground
22	N/C	No Connect
23	N/C	No Connect
24	N/C	No Connect
25	N/C	No Connect
26	N/C	No Connect
27	GND	Ground
28	N/C	No Connect
29	N/C	No Connect
30	N/C	No Connect
31	N/C	No Connect

32	N/C	No Connect
33	GND	Ground
34	N/C	No Connect
35	N/C	No Connect
36	N/C	No Connect
37	N/C	No Connect
38	DEVSLP (I) (0/3.3V)	Device Sleep, Input. When driven high the host is informing the SSD to enter a low power state
39	GND	Ground
40	N/C	No Connect
41	SATA A+	SATA differential signals in the SATA specification
42	N/C	No Connect
43	SATA A-	SATA differential signals in the SATA specification
44	N/C	No Connect
45	GND	Ground
46	N/C	No Connect
47	SATA B-	SATA differential signals in the SATA specification
48	N/C	No Connect
49	SATA B+	SATA differential signals in the SATA specification
50	N/C	No Connect
51	GND	Ground
52	N/C	No Connect
53	N/C	No Connect
54	N/C	No Connect
55	N/C	No Connect
56	N/C	Not Connect
57	GND	Ground
58	N/C	No Connect
59	Module Key	
60	Module Key	
61	Module Key	
62	Module Key	
63	Module Key	
64	Module Key	
65	Module Key	
66	Module Key	
67	N/C	No Connect

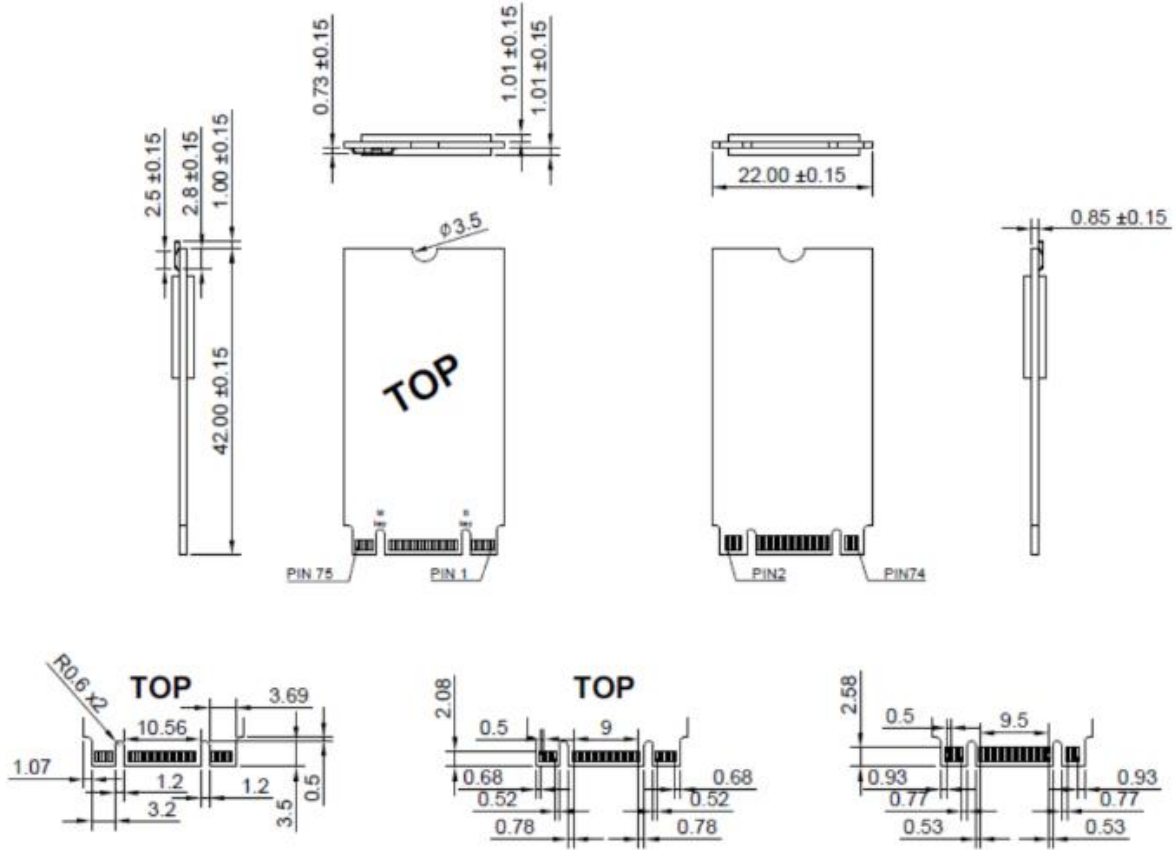
68	N/C	No Connect
69	CONFIG_1 = GND	Defines module type
70	3.3V	Supply pin
71	GND	Ground
72	3.3V	Supply pin
73	GND	Ground
74	3.3V	Supply pin
75	CONFIG_2 = GND	Ground

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6. PHYSICAL DIMENSION



Dimension: 42mm(L) x 22mm(W) x 3.8mm(H)



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7. ORDERING INFORMATION



Capacity	MPN (Diamond Grade)	MPN (Silver Grade)
32GB	FSSL032GBE-M500	FSSL032GBS-M500
30GB	FSSL030GBE-M500	FSSL030GBS-M500
64GB	FSSL064GBE-M500	FSSL064GBS-M500
60GB	FSSL060GBE-M500	FSSL060GBS-M500
128GB	FSSL128GBE-M500	FSSL128GBS-M500
120GB	FSSL120GBE-M500	FSSL120GBS-M500
256GB	FSSL256GBE-M500	FSSL256GBS-M500
240GB	FSSL240GBE-M500	FSSL240GBS-M500
512GB	FSSL512GBE-M500	FSSL512GBS-M500
480GB	FSSL480GBE-M500	FSSL480GBS-M500
1TB	FSSL001TBE-M500	FSSL001TBS-M500
960GB	FSSL960GBE-M500	FSSL960GBS-M500

Power Loss Protection

Capacity	MPN (Diamond Grade)	MPN (Silver Grade)
32GB	FSSL032GBE-M50P	FSSL032GBS-M50P
30GB	FSSL030GBE-M50P	FSSL030GBS-M50P
64GB	FSSL064GBE-M50P	FSSL064GBS-M50P
60GB	FSSL060GBE-M50P	FSSL060GBS-M50P
128GB	FSSL128GBE-M50P	FSSL128GBS-M50P
120GB	FSSL120GBE-M50P	FSSL120GBS-M50P
256GB	FSSL256GBE-M50P	FSSL256GBS-M50P
240GB	FSSL240GBE-M50P	FSSL240GBS-M50P
512GB	FSSL512GBE-M50P	FSSL512GBS-M50P
480GB	FSSL480GBE-M50P	FSSL480GBS-M50P
1TB	FSSL001TBE-M50P	FSSL001TBS-M50P
960GB	FSSL960GBE-M50P	FSSL960GBS-M50P

AES 256 and TCG OPAL

Capacity	MPN (Diamond Grade)	MPN (Silver Grade)
32GB	FSSL032GBE-M50S	FSSL032GBS-M50S
30GB	FSSL030GBE-M50S	FSSL030GBS-M50S
64GB	FSSL064GBE-M50S	FSSL064GBS-M50S
60GB	FSSL060GBE-M50S	FSSL060GBS-M50S
128GB	FSSL128GBE-M50S	FSSL128GBS-M50S
120GB	FSSL120GBE-M50S	FSSL120GBS-M50S
256GB	FSSL256GBE-M50S	FSSL256GBS-M50S
240GB	FSSL240GBE-M50S	FSSL240GBS-M50S
512GB	FSSL512GBE-M50S	FSSL512GBS-M50S
480GB	FSSL480GBE-M50S	FSSL480GBS-M50S
1TB	FSSL001TBE-M50S	FSSL001TBS-M50S
960GB	FSSL960GBE-M50S	FSSL960GBS-M50S

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Revision History

Revision	Draft Date	History
1.0	2019/08	Preliminary release
1.1	2019/11	Update performance
1.2	2020/05	Update Ordering Information
1.3	2021/07	Update Ordering Information
1.4	2021/09	Update Ordering Information
1.5	2021/09	Update Capacity

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