Industrial 2.5” SATA SSD Specification

(INSPIRE Series, 3D TLC)

Version 1.6

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1. GENERAL DESCRIPTION

1.1. Introduction

FLEXXON's INSPIRE 2.5" SSD has SATA III interface, and is fully compliant with standard 2.5-inch Form Factor. It supports high performance, high endurance, good compatibility and provides comprehensive data protection. It is suitable for multi-tasking application.

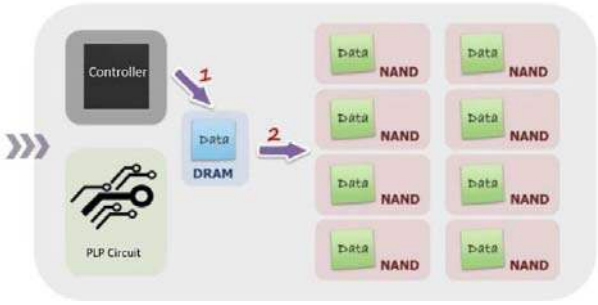
1.2. Product Overview

- **Flash**
  - 3D TLC
- **Capacity**
  - 32GB up to 2TB
- **SATA Interface**
  - Compliant with SATA Revision 3.2
  - Compatible with SATA 1.5Gbps, 3Gbps and 6Gbps interface
- **ECC Scheme**
  - INSPIRE 2.5" SSD 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)

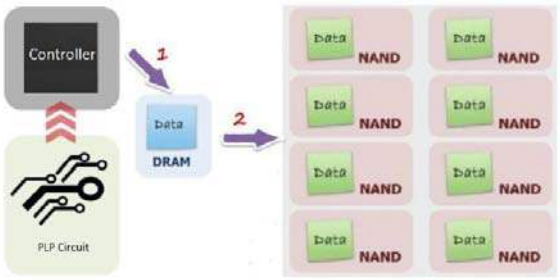
FLEXXON designs SSD device with a hardware power loss protection mechanism. It has a voltage drop detector, so when the SSD device detects the host power dropping, the SSD's power loss protection circuit will be triggered and begin providing power to the SSD. The SSD then will start to flush cached data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

Normal operation



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

Unexpected Power Loss happens



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 2.5" SSD

Capacity	Sequential		CrystalDiskMark	
	Read (MB/s)	Write (MB/s)	Read (IOPS)	Write (IOPS)
32GB	279	104	30712	16235
60/64GB	390	208	51274	30995
120/128GB	553	402	116027	78352
240/256GB	493	406	101553	78520
480/512GB	563	511	132818	109676
960GB/1TB	565	521	116218	115927
1920GB/2TB	565	520	116218	115906

NOTES:

1. The performance was measured using CrystalDiskMarkv5.0x64 with SATA 6Gbps host.
2. Performance may differ according to flash configuration and platform.

2.2. Power

Table 2-2 Supply Voltage of INSPIRE 2.5" SSD

Parameter	Rating
Operating Voltage	5V +/-5%

Table 2-3 Power Consumption of INSPIRE 2.5" SSD

Parameter	Power Consumption (W)
Idle (Max.)	0.64W
Active (Max.)	4.56W

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	1536
2TB	3072

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 2.5" 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

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

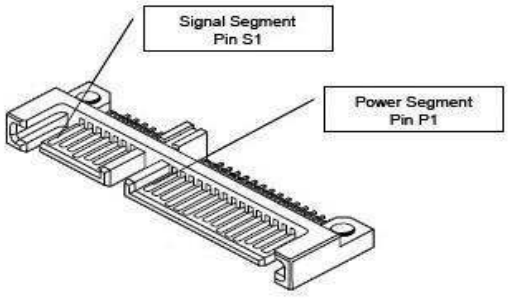


Figure 5-1 Pin Assignment of INSPIRE 2.5" SSD

Table 5-1 Signal Segment Pin Assignment and Description

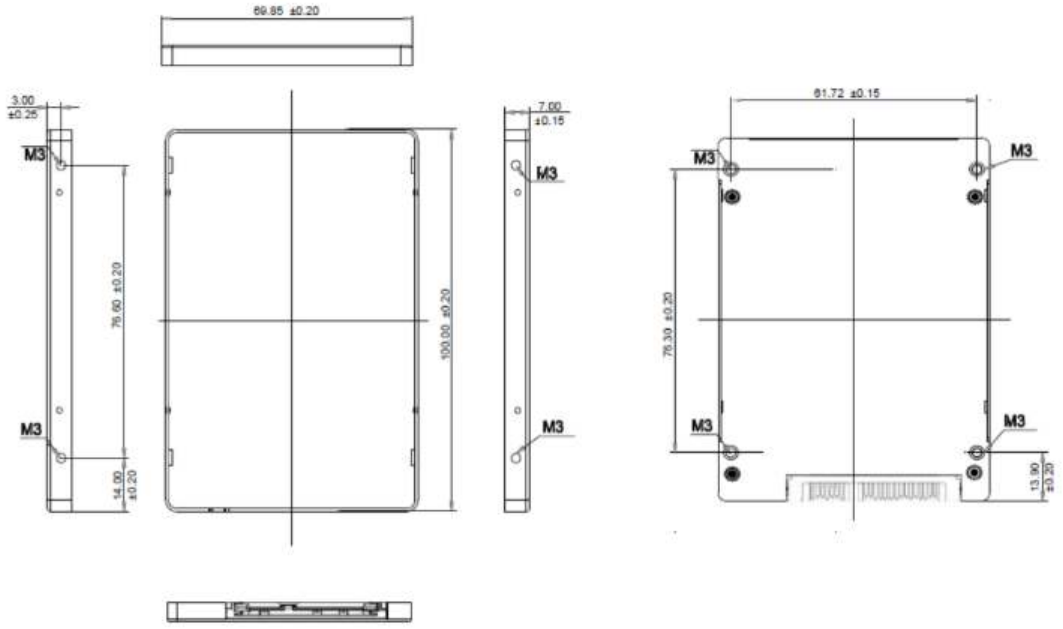
Pin Number	Function
S1	GND
S2	RX+ (Differential Signal Pair A)
S3	RX– (Differential Signal Pair A)
S4	GND
S5	TX– (Differential Signal Pair B)
S6	TX+ (Differential Signal Pair B)
S7	GND

Table 5-2 Power Segment Pin Assignment and Descriptions

Pin Number	Function
P1	NC
P2	NC
P3	DEVSLP
P4	GND
P5	GND
P6	GND
P7	5V
P8	5V
P9	5V
P10	GND
P11	DAS/DSS
P12	GND
P13	NC
P14	NC
P15	NC

6. PHYSICAL DIMENSION

Dimension: 100mm(L) x 69.85mm(W) x 7mm(H)



7. ORDERING INFORMATION

Capacity	MPN (Diamond Grade)	MPN (Silver Grade)
32GB	-	FSSB032GBS-M500
64GB	FSSB064GBE-M500	FSSB064GBS-M500
60GB	FSSB060GBE-M500	FSSB060GBS-M500
128GB	FSSB128GBE-M500	FSSB128GBS-M500
120GB	FSSB120GBE-M500	FSSB120GBS-M500
256GB	FSSB256GBE-M500	FSSB256GBS-M500
240GB	FSSB240GBE-M500	FSSB240GBS-M500
512GB	FSSB512GBE-M500	FSSB512GBS-M500
480GB	FSSB480GBE-M500	FSSB480GBS-M500
1TB	FSSB001TBE-M500	FSSB001TBS-M500
960GB	FSSB960GBE-M500	FSSB960GBS-M500
2TB	FSSB002TBE-M500	FSSB002TBS-M500
1920GB	FSSB1920BE-M500	FSSB1920BS-M500

Power Loss Protection

Capacity	MPN (Diamond Grade)	MPN (Silver Grade)
32GB	-	FSSB032GBS-M50P
64GB	FSSB064GBE-M50P	FSSB064GBS-M50P
60GB	FSSB060GBE-M50P	FSSB060GBS-M50P
128GB	FSSB128GBE-M50P	FSSB128GBS-M50P
120GB	FSSB120GBE-M50P	FSSB120GBS-M50P
256GB	FSSB256GBE-M50P	FSSB256GBS-M50P
240GB	FSSB240GBE-M50P	FSSB240GBS-M50P
512GB	FSSB512GBE-M50P	FSSB512GBS-M50P
480GB	FSSB480GBE-M50P	FSSB480GBS-M50P
1TB	FSSB001TBE-M50P	FSSB001TBS-M50P
960GB	FSSB960GBE-M50P	FSSB960GBS-M50P
2TB	FSSB002TBE-M50P	FSSB002TBS-M50P
1920GB	FSSB1920BE-M50P	FSSB1920BS-M50P

Conformal coating

Capacity	MPN (Diamond Grade)	MPN (Silver Grade)
32GB	-	FSSB032GBS-M50V
64GB	FSSB064GBE-M50V	FSSB064GBS-M50V
60GB	FSSB060GBE-M50V	FSSB060GBS-M50V
128GB	FSSB128GBE-M50V	FSSB128GBS-M50V
120GB	FSSB120GBE-M50V	FSSB120GBS-M50V
256GB	FSSB256GBE-M50V	FSSB256GBS-M50V
240GB	FSSB240GBE-M50V	FSSB240GBS-M50V
512GB	FSSB512GBE-M50V	FSSB512GBS-M50V
480GB	FSSB480GBE-M50V	FSSB480GBS-M50V
1TB	FSSB001TBE-M50V	FSSB001TBS-M50V
960GB	FSSB960GBE-M50V	FSSB960GBS-M50V
2TB	FSSB002TBE-M50V	FSSB002TBS-M50V
1920GB	FSSB1920BE-M50V	FSSB1920BS-M50V

AES256, TCG OPAL

Capacity	MPN (Diamond Grade)	MPN (Silver Grade)
32GB	-	FSSB032GBS-M50S
64GB	FSSB064GBE-M50S	FSSB064GBS-M50S
60GB	FSSB060GBE-M50S	FSSB060GBS-M50S
128GB	FSSB128GBE-M50S	FSSB128GBS-M50S
120GB	FSSB120GBE-M50S	FSSB120GBS-M50S
256GB	FSSB256GBE-M50S	FSSB256GBS-M50S
240GB	FSSB240GBE-M50S	FSSB240GBS-M50S
512GB	FSSB512GBE-M50S	FSSB512GBS-M50S
480GB	FSSB480GBE-M50S	FSSB480GBS-M50S
1TB	FSSB001TBE-M50S	FSSB001TBS-M50S
960GB	FSSB960GBE-M50S	FSSB960GBS-M50S
2TB	FSSB002TBE-M50S	FSSB002TBS-M50S
1920GB	FSSB1920BE-M50S	FSSB1920BS-M50S

Conformal coating and Power Loss Protection

Capacity	MPN (Diamond Grade)	MPN (Silver Grade)
32GB	-	FSSB032GBS-M50D
64GB	FSSB064GBE-M50D	FSSB064GBS-M50D
60GB	FSSB060GBE-M50D	FSSB060GBS-M50D
128GB	FSSB128GBE-M50D	FSSB128GBS-M50D
120GB	FSSB120GBE-M50D	FSSB120GBS-M50D
256GB	FSSB256GBE-M50D	FSSB256GBS-M50D
240GB	FSSB240GBE-M50D	FSSB240GBS-M50D
512GB	FSSB512GBE-M50D	FSSB512GBS-M50D
480GB	FSSB480GBE-M50D	FSSB480GBS-M50D
1TB	FSSB001TBE-M50D	FSSB001TBS-M50D
960GB	FSSB960GBE-M50D	FSSB960GBS-M50D
2TB	FSSB002TBE-M50D	FSSB002TBS-M50D
1920GB	FSSB1920BE-M50D	FSSB1920BS-M50D

Revision History

Revision	Draft Date	History
1.0	2019/08	Preliminary release
1.1	2019/10	Update Ordering Information
1.2	2019/12	Update performance
1.3	2020/01	Update Ordering Information
1.4	2020/09	Update Ordering Information
1.5	2021/04	Update Capacity
1.6	2022/04	Update Ordering Information