Reliability Report
Industrial Grade mSATA SSD (pSLC)

INSIGNIS TECHNOLOGY CORPORATION

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Product Information

Product Name	mSATA SSD (pSLC)
Ordering Information	NSMS51J004-IT NSMS51J008-IT NSMS51J016-IT NSMS51J032-IT NSMS51J064-IT NSMS51J128-IT NSMS51J256-IT NSMS51J004-IP NSMS51J008-IP NSMS51J016-IP NSMS51J032-IP NSMS51J064-IP NSMS51J128-IP NSMS51J256-IP
Grade Temperature	Industrial Grade: -40 ~ 85℃
Flash Type	15nm MLC

Result Overview

	Test Item	Test Reference	Sample Size	Test Result
1	High Temperature Storage Test	IEC 60068-2-2	5	Pass
2	High Temperature Operation Test	IEC 60068-2-2	5	Pass
3	Low Temperature Storage Test	IEC 60068-2-1	5	Pass
4	Low Temperature Operation Test	IEC 60068-2-1	5	Pass
5	Temperature & Humidity Storage Test	IEC 60068-2-3	5	Pass
6	Temperature & Humidity Operation Test	IEC 60068-2-3	5	Pass
7	Temperature Cycling Operation Test	IEC 60068-2-14	5	Pass
8	Drop Test	INSIGNIS SPEC.	5	Pass
9	Vibration Test	IEC 60068-2-6	5	Pass
10	Mechanical Shock Test	IEC 60068-2-27	5	Pass
11	Four Corner Test	INSIGNIS SPEC.	2	Pass
12	Power cycling Test	INSIGNIS SPEC.	2	Pass

Test Items vs. Conditions

High Temperature Storage Test

Purpose:

Verify the storage ability of a device in a high temperature environment.

Test Conditions:

- Temperature: 85℃
- Duration: 168 hrs
- DUT State: Storage
- Quantity: 5 PCS
- Temperature & Humidity Equipment: KSON-THS-A4T
- Laboratory Ambience: 23±3℃, 50%±3%(RH)

Pass/Fail Criteria:

1. To ensure that no abnormalities with physical appearance are found or any electrical function failures are detected.
2. Appearance criteria: Refer to product appearance inspection specification.
   Electrical function: Burn in 5 cycles by PC. No data read error, no data write error and no data comparison error as well.

Test Result:

Sample No.	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Appearance	Pass	Pass	Pass	Pass	Pass
Function	Pass	Pass	Pass	Pass	Pass

High Temperature Operation Test

Purpose:

Verify the operational ability of a device in a high temperature environment.

Test Conditions:

- Temperature: 85℃
- Duration: 72 hrs
- DUT State: Operation
- Quantity: 5 PCS
- Temperature & Humidity Equipment: KSON-THS-A4T
- Laboratory Ambience: 23±3℃, 50%±3%(RH)

Pass/Fail Criteria:

1. To ensure that no abnormalities with physical appearance are found or any electrical function failures are detected.
2. Appearance criteria: Refer to product appearance inspection specification.
   Electrical function: Burn in test by PC. No data read error, no data write error and no data comparison error as well.

Test Result:

Sample No.	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Appearance	Pass	Pass	Pass	Pass	Pass
Function	Pass	Pass	Pass	Pass	Pass

Low Temperature Storage Test

Purpose:

Verify the storage ability of a device in a low temperature environment.

Test Conditions:

- Temperature: -40℃
- Duration: 168 hrs
- DUT State: Storage
- Quantity: 5 PCS
- Temperature & Humidity Equipment: KSON-THS-A4T
- Laboratory Ambience: 23±3℃, 50%±3%(RH)

Pass/Fail Criteria:

1. To ensure that no abnormalities with physical appearance are found or any electrical function failures are detected.
2. Appearance criteria: Refer to product appearance inspection specification.
   Electrical function: Burn in 5 cycles by PC. No data read error, no data write error and no data comparison error as well.

Test Result:

Sample No.	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Appearance	Pass	Pass	Pass	Pass	Pass
Function	Pass	Pass	Pass	Pass	Pass

Low Temperature Operation Test

Purpose:

Verify the operational ability of a device in a low temperature environment.

Test Conditions:

- Temperature: -40℃
- Duration: 72 hrs
- DUT State: Operation
- Quantity: 5 PCS
- Temperature & Humidity Equipment: KSON-THS-A4T
- Laboratory Ambience: 23±3℃, 50%±3%(RH)

Pass/Fail Criteria:

1. To ensure that no abnormalities with physical appearance are found or any electrical function failures are detected.
2. Appearance criteria: Refer to product appearance inspection specification.
   Electrical function: Burn in test by PC. No data read error, no data write error and no data comparison error as well.

Test Result:

Sample No.	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Appearance	Pass	Pass	Pass	Pass	Pass
Function	Pass	Pass	Pass	Pass	Pass

Temperature and Humidity Storage Test

Purpose:

Verify the storage ability of a device in both a high temperature and high humidity environment.

Test Conditions:

- Temperature: 55℃
- Humidity: 95%
- Duration: 96 hrs
- DUT State: Storage
- Quantity: 5 PCS
- Temperature & Humidity Equipment: KSON-THS-A4T
- Laboratory Ambience: 23±3℃, 50%±3%(RH)

Pass/Fail Criteria:

1. To ensure that no abnormalities with physical appearance are found or any electrical function failures are detected.
2. Appearance criteria: Refer to product appearance inspection specification.
   Electrical function: Burn in 5 cycles by PC. No data read error, no data write error and no data comparison error as well.

Test Result:

Sample No.	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Appearance	Pass	Pass	Pass	Pass	Pass
Function	Pass	Pass	Pass	Pass	Pass

Temperature and Humidity Operation Test

Purpose:

Verify the operational ability of a device in both a high temperature and high humidity environment.

Test Conditions:

- Temperature: 55℃
- Humidity: 95%
- Duration: 72 hrs
- DUT State: Operation
- Quantity: 5 PCS
- Temperature & Humidity Equipment: KSON-THS-A4T
- Laboratory Ambience: 23±3℃, 50%±3%(RH)

Pass/Fail Criteria:

1. To ensure that no abnormalities with physical appearance are found or any electrical function failures are detected.
2. Appearance criteria: Refer to product appearance inspection specification.
   Electrical function: Burn in test by PC. No data read error, no data write error and no data comparison error as well.

Test Result:

Sample No.	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Appearance	Pass	Pass	Pass	Pass	Pass
Function	Pass	Pass	Pass	Pass	Pass

Temperature Cycling Operation Test

Purpose:

Verify whether an environment with constant thermal change affects the physical appearance and functions of a device or not.

Test Conditions:

- Temperature: -40℃~85℃
- Rise/Drop Rate: 1℃/min.
- Duration:
  - -40℃ for 30 minutes
  - 85℃ for 30 minutes
  - No. of cycles: 20
- DUT State: Operation
- Quantity: 5 PCS
- Temperature & Humidity Equipment: KSON-THS-A4T
- Laboratory Ambience: 23±3℃, 50%±3%(RH)

Pass/Fail Criteria:

1. To ensure that no abnormalities with physical appearance are found or any electrical function failures are detected.
2. Appearance criteria: Refer to product appearance inspection specification.
   Electrical function: Burn in test by PC. No data read error, no data write error and no data comparison error as well.

Test Result:

Sample No.	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Appearance	Pass	Pass	Pass	Pass	Pass
Function	Pass	Pass	Pass	Pass	Pass

Drop Test

Purpose:

To simulate the environment where the device experiences dropping to ground without any external protection.

Test Conditions:

- Mode: Unit
- Altitude: 0.8m
- Contact Location(s): 6 surfaces, each face 2 times
- DUT State: Storage
- Quantity: 5 PCS
- Equipment: Manual
- Laboratory Ambience: 23±3℃, 50%±3%(RH)

Pass/Fail Criteria:

1. To ensure that no abnormalities with physical appearance are found or any electrical function failures are detected.
2. Appearance criteria: Refer to product appearance inspection specification.
   Electrical function: Burn in 5 cycles by PC. No data read error, no data write error and no data comparison error as well.

Test Result:

Sample No.	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Appearance	Pass	Pass	Pass	Pass	Pass
Function	Pass	Pass	Pass	Pass	Pass

Vibration Test

Purpose:

Verify whether the device is capable of enduring vibrating environments such as transportation or installation; mechanical or functional failures might be induced under such conditions.

Test Conditions:

- Waveform: Sine waveform
- Frequency/Displacement: 20~80Hz/1.52mm
- Frequency/Acceleration: 80~2000Hz/20G
- Axis: X, Y, and Z
- Duration: 60 min/Axis
- No. of Trials: 1
- DUT State: Storage/Operation
- Quantity: 5 PCS
- Vibration Equipment: KD-9363-EM-600F3K-40N120
- Laboratory Ambience: 23±3℃, 55%±3%(RH)

Pass/Fail Criteria:

1. To ensure that no abnormalities with physical appearance are found or any electrical function failures are detected.
2. Appearance criteria: Refer to product appearance inspection specification.
   Electrical function: Burn in test by PC. No data read error, no data write error and no data comparison error as well.

Test Result:

Sample No.	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Appearance	Pass	Pass	Pass	Pass	Pass
Function	Pass	Pass	Pass	Pass	Pass

Mechanical Shock Test

Purpose:

Verify whether the device is capable of enduring an environment with sudden impacts such as bumping or dropping to ground; mechanical or functional failures might be induced under such conditions.

Test Conditions:

- Acceleration: 1500G with Half Sine Wave
- Duration: 0.5ms
- No. of Shocks: 18 shocks (3 shocks for each)
- DUT State: Storage/Operation
- Quantity: 5 PCS
- Equipment: KD-DP-1200-20
- Laboratory Ambience: 23±3℃, 55%±3%(RH)

Pass/Fail Criteria:

1. To ensure that no abnormalities with physical appearance are found or any electrical function failures are detected.
2. Appearance criteria: Refer to product appearance inspection specification.
   Electrical function: Burn in 5 cycles by PC. No data read error, no data write error and no data comparison error as well.

Test Result:

Sample No.	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Appearance	Pass	Pass	Pass	Pass	Pass
Function	Pass	Pass	Pass	Pass	Pass

Four Corner Test

Purpose:

Evaluate the design limit of the DUT with a Hi – low voltage and temperature test to maintain operational stability.

Test Conditions:

- Test Temperature limit range: High level 85℃ and Low level -40℃
- Rise/Drop Rate: 1℃/min.
- Test Voltage limit range: High level 3.6V (DC) and Low level 3.0V
- Duration:
  - -40℃ for 12 hours of each High and Low voltage
  - 85℃ for 12 hours of each High and Low voltage
- DUT State: Operation
- Quantity: 2 PCS
- Temperature & Humidity Equipment: KSON-THS-A4T
- Power Supply Equipment: Keysight E3648A 100W
- Software: Burn in Test 7.1 Pro.
- Laboratory Ambience: 23±3℃, 55%±3%(RH)

Pass/Fail Criteria:

1. To ensure that no abnormalities with physical appearance are found or any electrical function failures are detected.
2. Appearance criteria: Refer to product appearance inspection specification.
   Electrical function: Burn in test by PC. No data read error, no data write error and no data comparison error as well.

Test Result:

Sample 1	Temperature	Voltage	Duration	Result
Level 1	-40℃	3.6V	12 hours	Pass
Level 2	-40℃	3.0V	12 hours	Pass
Level 3	85℃	3.0V	12 hours	Pass
Level 4	85℃	3.6V	12 hours	Pass

Sample 2	Temperature	Voltage	Duration	Result
Level 1	-40℃	3.6V	12 hours	Pass
Level 2	-40℃	3.0V	12 hours	Pass
Level 3	85℃	3.0V	12 hours	Pass
Level 4	85℃	3.6V	12 hours	Pass

Power Cycling Test

Purpose:

Evaluate the design limit of the DUT with a Hi – low temperature and power on/off test to maintain operational stability.

Test Conditions:

- Test Temperature limit range: High level 85℃ and Low level -40℃
- Rise/Drop Rate: 1℃/min.
- Power on/off frequency: Every 24 hours at least 500 times
- Duration:
  - -40℃ for 24 hours
  - 85℃ for 24 hours
- DUT State: Operation
- Quantity: 2 PCS
- Temperature & Humidity Equipment: KSON-THS-A4T
- Timer Equipment: TDVY-M6
- Laboratory Ambience: 23±3℃, 55%±3%(RH)

Pass/Fail Criteria:

1. To ensure that no abnormalities with physical appearance are found or any electrical function failures are detected.
2. Appearance criteria: Refer to product appearance inspection specification.
   Electrical function: Burn in test by PC. No data read error, no data write error and no data comparison error as well.

Test Result:

Sample No.	Sample 1	Sample 2
Power cycling at -40℃ for 24 hours	Pass	Pass
Power cycling at 85℃ for 24 hours	Pass	Pass

CONCLUSION

All of the samples passed the functional, electrical characteristic, and cosmetic checks before, during and after each reliability test.