Reliability Qualification Report

for

4Gb 1.8V Parallel NAND FLASH
with Pb/Halogen Free
(Industrial)

Issued Date: April 07, 2023

Contents :

1. Title

2. Product and Package Information

3. Result Summary

4. Accelerated Lifetime Simulation Tests

5. Accelerated Environment Stress Tests

6. Electrical Verification Tests (Electrostatic Discharge & Latch-up)

1. Title

This report describes the reliability and qualification data of Alliance product listed below. The qualification and reliability tests have been completed successfully based on Alliance standard.

2. Product and Package Information

Product Code	: AS9F14G08SA-45BIN
Operating Temperature	: -40°C to +85°C
Package Type	: FBGA 63B (9.0x11.0mm, 1.0T)
Flammability	: UL-V0
Solder ball	: SAC1205N (98.25% Sn / 1.2% Ag / 0.5% Cu / 0.05% Ni)

3. Result Summary

Lifetime Simulation Tests	: Passed ELFR & HTOL
Environment Stress Tests	: Passed All Tests
ESD & Latch-up	: Passed HBM 2000V, CDM 500V & Latch-up ±500mA

4. Accelerated Lifetime Simulation Tests

Group	Test Item / Conditions	Test Method	Duration or Level	Result: Failed Q'ty / Tested Q'ty	Notes
Accelerated Lifetime Simulation Tests	**Early Life Failure Rate** 125°C, Dynamic stress	JESD22-A108	48 hours	0 / 1000 (Passed)	1, 2
	High Temperature Operating Life 125°C, Dynamic stress	JESD22-A108	1008 hours	0 / 116 (Passed)	1, 2
	Endurace 25°C, Dynamic stress, Program/Read"0"/Erase/Read "1" cycling	JESD22-A117	100k cycles	0 / 231 (Passed)	1,2
	High Temperature Data Retention 125°C, All bit cells programmed Preconditioning : 10k Endurance test at high temperature above	JESD22-A117	100 hours	0 / 231 (Passed)	1
	Low Temperature Data Retention 25°C, All bit cells programmed Preconditioning : 100k Endurance test at low temperature above	JESD22-A117	1008 hours	0 / 116 (Passed)	1

Note :
1) Electrical test is performed before and after each item.
2) "Dynamic stress" means continuous memory operation like read or write function.

* Failure Rate Estimation

Estimation Condition :

User Operating Temperature : 55°C
User Operating Voltage : Worst case (Maximum Operating Voltage in the Datasheet)
Confidence Level : 60%

NAND :

Early Life (Ea = 0.7 eV, β = 8) : 55.39 FITs
Inherent Life (Ea = 0.7eV, β = 8) : 30.32 FITs

5. Accelerated Environment Stress Tests

<table>
<tr><th rowspan="2">Group</th><th rowspan="2">Test Item
/ Conditions</th><th rowspan="2">Test
Method</th><th rowspan="2">Duration
or Level</th><th>Result</th><th rowspan="2">Notes</th></tr>
<tr><th>Failed Q'ty /
Tested Q'ty</th></tr>
<tr><td rowspan="4">Accelerated Environment Stress Tests</td><td>Preconditioning
Temperature Cycling : -55°C to 125°C
Bake : 125°C
Soak : 30°C, 60% RH
Reflow : 260°C</td><td>JESD22 A113</td><td>Level 3
5 cycles
24 hours
192 hours
3 cycles</td><td>0 / 90
(Passed)</td><td>1</td></tr>
<tr><td>Unbiased HAST
110°C, 85% RH</td><td>JESD22-A118</td><td>264 hours</td><td>0 / 45
(Passed)</td><td>1, 2</td></tr>
<tr><td>Temperature Cycling
-65°C to 150°C</td><td>JESD22-A104</td><td>500 cycles</td><td>0 / 45
(Passed)</td><td>1, 2</td></tr>
<tr><td>High Temperature Storage Life
150°C</td><td>JESD22-A103</td><td>1008 hours</td><td>0 / 45
(Passed)</td><td>1</td></tr>
</table>

Note :

1) Electrical test is performed before and after each item.

2) Preconditioning is performed before the test.

6. Electrical Verification Tests (Electrostatic Discharge & Latch-up)

Group	Test Item / Conditions	Test Method	Duration or Level	Result: Failed Q'ty / Tested Q'ty	Notes
Electrical Verification Tests	**ESD Human Body Model**	JS-001-2017	2000V	0 / 9 (Pass)	1, 2
	ESD Charged Device Model	JESD22-C101	5000V	0 / 3 (Pass)	1, 2
	Latch-Up (I-test)	JESD78	±500mA	0 / 6 (Pass)	1, 2

Note :

1) Electrical test is performed before and after each item.

2) HBM, CDM and Latch-up tests are performed at room temperature.