

Reliability Qualification Report

for

**4GB eMMC with Pb/Halogen Free
(Industrial)**

Issued Date: April 07, 2022

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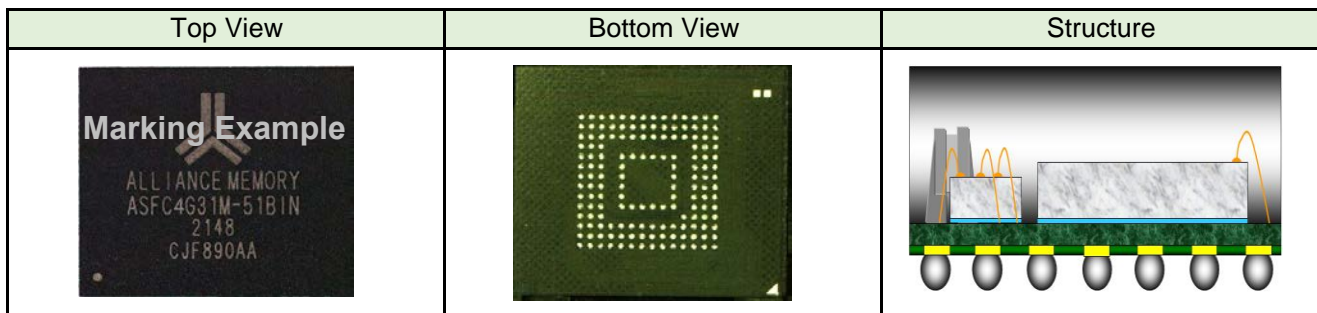
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1. Title

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 : ASFC4G31M-51BIN
 Operating Temperature : -40°C to +85°C (Industrial)
 Package Type : FBGA 153B (11.5x13.0mm, 1.0T)
 Flammability : UL-V0
 Solder ball : SAC305 (96.5% Sn / 3.0% Ag / 0.5% Cu)



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 ±150mA

4. Accelerated Lifetime Simulation Tests

Group	Test Item / Conditions	Test Method	Duration or Level	Result	Notes
				Failed Q'ty / Tested Q'ty	
Accelerated Lifetime Simulation Tests	Early Life Failure Rate 125°C, Dynamic stress	JESD22-A108	96 hours	0 / 1000 (Passed)	1, 2
	High Temperature Operating Life 125°C, Dynamic stress	JESD22-A108	1000 hours	0 / 387 (Passed)	1, 2
	Endurance 25°C, Dynamic stress, Program/Read"0"/Erase/Read "1" cycling	JESD22-A117	3k cycles	0 / 231 (Passed)	1,2
	Data Retention 85°C, All bit cells programmed Preconditioning : 300 cylce Endurance test	JESD22-A117	Pre E/W+ 160hrs	0 / 231 (Passed)	1,3,4
	Data Retention 85°C, All bit cells programmed Preconditioning : 3K cylce Endurance test	JESD22-A117	Pre E/W+ 60hrs	0 / 231 (Passed)	1,3,4

Note :

- 1) Electrical test is performed before and after each item.
Above data is verified by providing data randomization and 48bit/1KByte ECC with Read Retry.
- 2) "Dynamic stress" means continuous memory operation like read or write function.
- 3) 160hrs of bake time is equivalent to 3 year.
60hrs of bake time is equivalent to 1 year.
- 4) The user's conditions of use were calculated at 40°C

5. Accelerated Environment Stress Tests

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

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	Notes
				Failed Q'ty / Tested Q'ty	
Electrical Verification Tests	ESD Human Body Model	JS-001-2017	2000V	0 / 15 (Pass)	1, 2
	ESD Charged Device Model	JESD22-C101	500V	0 / 3 (Pass)	1, 2
	Latch-Up (I-test)	JESD78	±150mA	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.