

Reliability Qualification Report

for

**16GB eMMC with Pb/Halogen Free
(Industrial)**

Issued Date: May 06, 2024

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)

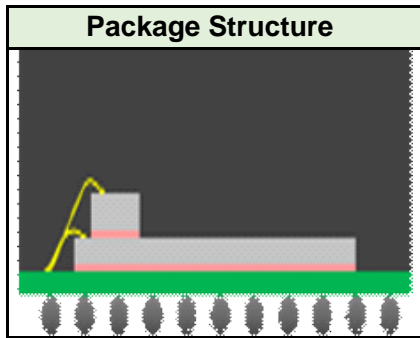
1. Title

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	: 16GB eMMC (x8)
Operating Temperature	: ASFC16G31M-51BIN
Operating Voltage - eMMC	: -40°C to + 85°C
	: VCCQ_LOW 1.7~1.95V, VCCQ_HIGH 2.7~3.6V, VCC 2.7~3.6V
	: FBGA 153 Ball (11.5 x 13.0mm, 1.0T)
Solder Ball Type	: SAC305
Solder Ball Composition	: Sn balance, 3.0% Ag, 0.5% Cu
Flammability	: UL-V0



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 \pm 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 (ELFR) 125°C, Dynamic stress	JESD22-A108	168 hours	0 / 1000 (Passed)	1, 2
	High Temp. Operating Life (HTOL) 125°C, Dynamic stress		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 <i>Preconditioning : 300 cycles Endurance test</i>		Pre E/W+ 160 hours	0 / 231 (Passed)	1, 3, 4
	Data Retention 85°C, All bit cells programmed <i>Preconditioning : 3k cycles Endurance test</i>		Pre E/W+ 60 hours	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.
- 2) "Dynamic stress" means continuous memory operation like read or write function.
- 3) Bake time for 160 hours is equivalent to 3 years.
Bake time for 60 hours is equivalent to 1 year.
- 4) The user's conditions of use are 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 / 150 (Passed)	1
	Unbiased HAST (UHAST) 110°C, 85% RH	JESD22-A118	264 hours	0 / 75 (Passed)	1, 2
	Temperature Cycling (TC) -65°C to 150°C	JESD22-A104	500 cycles	0 / 75 (Passed)	1, 2
	High Temperature Storage Life (HTSL) 150°C	JESD22-A103	1000 hours	0 / 75 (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 (HBM)	JS-001-2017	2000V	0 / 15 (Passed)	1, 2
	ESD Charged Device Model (CDM)	JESD22-C101	500V	0 / 3 (Passed)	1, 2
	Latch-Up (LU I-test)	JESD78	±150mA	0 / 6 (Passed)	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.