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# **Reliability Qualification Report**

for

**8GB eMMC with Pb/Halogen Free  
(Industrial)**

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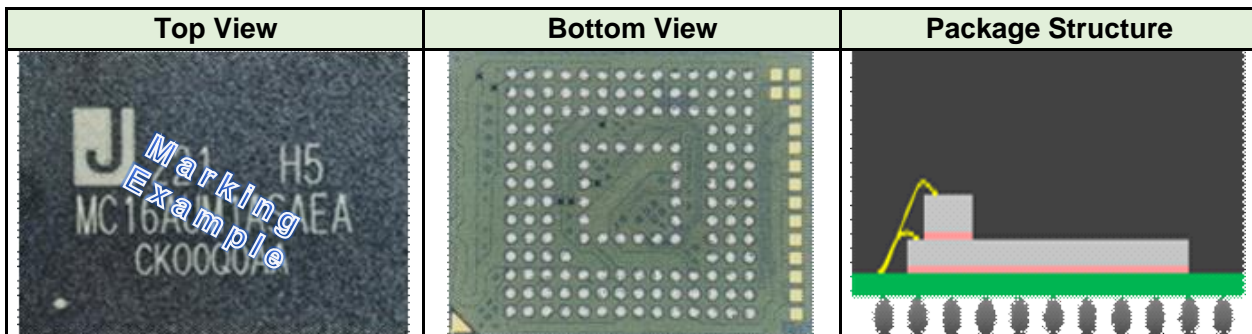
## 1. Title

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

	: 16GB eMMC (x8)
Product Code	: ASFC16G31M-51BIN
Operating Temperature	: -40°C to + 85°C
Operating Voltage - eMMC	: 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 $\pm 150\text{mA}$

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## 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	<b>Early Life Failure Rate (ELFR)</b> 125°C, Dynamic stress	JESD22-A108	168 hours	0 / 1000 (Passed)	1, 2
	<b>High Temp. Operating Life (HTOL)</b> 125°C, Dynamic stress		1000 hours	0 / 387 (Passed)	1, 2
	<b>Endurance</b> 25°C, Dynamic stress, Program/Read"0"/Erase/Read "1" cycling	JESD22-A117	3k cycles	0 / 231 (Passed)	1, 2
	<b>Data Retention</b> 85°C, All bit cells programmed <i>Preconditioning : 300 cycles Endurance test</i>		Pre E/W+ 160 hours	0 / 231 (Passed)	1, 3, 4
	<b>Data Retention</b> 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	<b>Preconditioning</b> Temperature Cycling : -55°C to 125°C Bake : 125°C Soak : 30°C, 60% RH Reflow : 260°C	JESD22-A113	<b>Level 3</b> 5 cycles 24 hours 192 hours 3 cycles	0 / 150 (Passed)	1
	<b>Unbiased HAST (UHAST)</b> 110°C, 85% RH	JESD22-A118	264 hours	0 / 75 (Passed)	1, 2
	<b>Temperature Cycling (TC)</b> -65°C to 150°C	JESD22-A104	500 cycles	0 / 75 (Passed)	1, 2
	<b>High Temperature Storage Life (HTSL)</b> 150°C	JESD22-A103	1000 hours	0 / 75 (Passed)	1
<b>Note :</b> 1) Electrical test is performed before and after each item. 2) Preconditioning is performed before the test.					

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## 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.
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