

# Reliability Qualification Report

for

**LPDDR SDRAM with Pb/Halogen Free  
(Industrial)**

**(16M×16, 45nm SDRAM AS4C16M16MSB-6BIN)**

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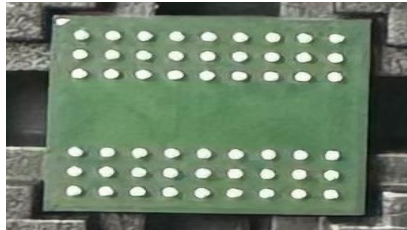
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## 1. Title

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

## 2. Product and Package Information

Product Code	: AS4C16M16MSB-6BIN
Product Description	: 256Mb LPDDR
Operating Temperature Range	: -40°C to +85°C
Operating Voltage	: VDD/VDDQ 1.7~1.95V
Package Type	: FBGA 54B (8.0x8.0mm, 1.0T)
Flammability	: UL-V0



## 3. Result Summary

Process Results	: Pass All Items
Lifetime Simulation Tests	: Pass ELFR & HTOL
Environment Stress Tests	: Pass All Tests
Environment Compliance	: Meet All Items

## 4. Accelerated Lifetime Simulation Tests

Group	Test Item / Conditions	Test Method	Duration or Level	Result		Notes
				Number of Lots	Failed Q'ty / Tested Q'ty	
Accelerated Lifetime Simulation Tests	<b>Early Life Failure Rate</b> 125°C, VDD/VDDQ/VPP Dynamic stress	JESD22-A108	48 hours	1	0 / 2300 (Pass)	1, 2
	<b>High Temperature Operating Life</b> 125°C, VDD/VDDQ/VPP Dynamic stress	JESD22-A108	1008 hours	1	0 / 231 (Pass)	1, 2

**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 : Typical VPP  
 Operating Voltage : VDD/VDDQ & VPP  
 Confidence Level : 60%

$$AF_{OVERALL} = AF_T * AF_V = 22.5 * 7.92 = 178$$

Early Life (Ea = 0.5 eV,  $\beta$  = 6.9) : 46.6 FITs

Inherent Life (Ea = 0.5 eV,  $\beta$  = 6.9) : 17.0 FITs

## 5. Accelerated Environment Stress Tests

Group	Test Item / Conditions	Test Method	Duration or Level	Result		Notes
				Number of Lots	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	1	0 / 225 (Pass)	1
	<b>Temperature &amp; Humidity</b> 85°C, 85% RH	JESD22-A101	504 hours	1	0 / 75 (Pass)	1, 2
	<b>Temperature Cycling</b> -50°C to 125°C	JESD22-A104	1000 cycles	1	0 / 75 (Pass)	1, 2
	<b>Pressure Cooker Test</b> 121°C, 100%RH, 2ATM	JESD22-A102	168 hours	1	0 / 75 (Pass)	1, 2
	<b>Low Temperature Storage Life</b> -50°C	JESD22-A119	1008 hours	1	0 / 75 (Pass)	1
	<b>High Temperature Storage Life</b> 150°C	JESD22-A103	1008 hours	1	0 / 75 (Pass)	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
				Number of Lots	Failed Q'ty / Tested Q'ty	
Electrical Verification Tests	ESD Human Body Model	JESD22-A114	2000V	1	0 / 9 (Pass)	1, 2
	ESD Charged Device Model	JESD22-C101	1000V	1	0 / 3 (Pass)	1, 2
	Latch-Up (I-test) - Test at 105°C	JESD78	±200mA	1	0 / 6 (Pass)	1
	Latch-Up (Overvoltage) - Test at 105°C		3V	1	0 / 3 (Pass)	1, 3

**Note :**

- 1) All electrical tests at different temperatures are performed before and after each item.
- 2) HBM & CDM tests are performed at room temp.
- 3) 3V is applied for VDD/VDDQ.