Reliability Qualification Report

for

LPSDR SDRAM with Pb/Halogen Free (Industrial)

(32M×16, 45nm SDRAM AS4C32M16MSB-6BIN)

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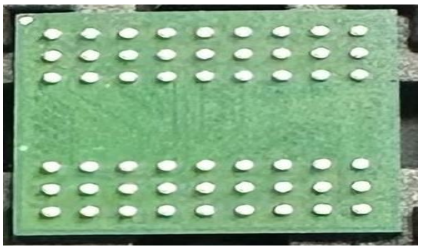
1. Title

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 : AS4C32M16MSB-6BIN
Product Description : 512Mb LPSDR
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	**Early Life Failure Rate** 125°C, VDD/VDDQ/VPP Dynamic stress	JESD22-A108	48 hours	1	0 / 2300 (Pass)	1, 2
	High Temperature Operating Life 125°C, VDD/VDDQ/VPP Dynamic stress	JESD22-A108	504 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℃
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, β = 6.9) : 46.6 FITs
Inherent Life (Ea = 0.5 eV, β = 6.9) : 44.2 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	**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	1	0 / 225 (Pass)	1
	Temperature & Humidity 85°C, 85% RH	JESD22-A101	504 hours	1	0 / 75 (Pass)	1, 2
	Temperature Cycling -50°C to 125°C	JESD22-A104	1000 cycles	1	0 / 75 (Pass)	1, 2
	Pressure Cooker Test 121°C, 100%RH, 2ATM	JESD22-A102	168 hours	1	0 / 75 (Pass)	1, 2
	Low Temperature Storage Life -50°C	JESD22-A119	1008 hours	1	0 / 75 (Pass)	1
	High Temperature Storage Life 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.