

Automotive AEC-Q100 Grade 2 Compliance

Reliability Qualification Report

for

DDRIII L SDRAM with Pb/Halogen Free

(512Mx8, 25nm SDRAM AS4C512M8D3LC-xxBAN)

Issued Date: Nov 13, 2020

CONTENTS

0. RELIABILITY TEST SUMMARY.....	1
1. INTRODUCTION	2
2. PRODUCT INFORMATION	2
3. RELIABILITY	2
3.1. Sample Preparation Flow	2
3.2. Life Test	3
3.2.1. Test Flow.....	3
3.2.2. Test Criteria.....	3
3.2.3. Failure Rate Calculation and Test Result.....	4
3.3. Environmental Test.....	6
3.3.1. Test Flow.....	7
3.3.2. Test Condition and Time	7
3.3.3. Test Criteria and Result.....	10
3.4. ESD Test.....	11
3.5. Latch-Up Test.....	11
4. CONCLUSION	12

Automotive AEC-Q100 Grade 2 Compliance Reliability Qualification Report for AS4C512M8D3LC (512M x 8 DDRIIIL SDRAM with Pb/Halogen Free)

0. RELIABILITY TEST SUMMARY

Test Item	Test Condition	Pass Criteria	Test Result
EFR	1.2*Vint, 125°C, 48Hrs	0 - 1 (Year) ≤ 1000 (DPM)	0/800 x 3 0 DPM (PASS)
OLT	1.1*Vint, 125°C, 1000Hrs	1 - 10 (Year)	0/77 x 3 15 FIT (PASS)
		≤ 50 (FIT)	MTBF= 67 x 10 ⁶ Hrs
MSLT	Level III	0/1 (A/R)	0/231 x 3 (PASS)
HTST	150°C, 1000Hrs	0/1 (A/R)	0/45 x 1 (PASS)
TCT	-65°C ~ +150°C, @3cph, 500Cycles	0/1 (A/R)	0/77 x 3 (PASS)
PCT	121°C, 100%R.H., 2.0atm, 96Hrs	0/1 (A/R)	0/77 x 3 (PASS)
HAST	130°C, 85%R.H., 2.3atm, 1.45V, 96Hrs	0/1 (A/R)	0/77 x 3 (PASS)
ESD	HBM: R=1.5KΩ, C=100pF	≥ ±2KV	0/3 x 1 (PASS)
	MM: R=0KΩ, C=200pF	≥ ±200V	0/3 x 1 (PASS)
	CDM: Non-Socket Mode	≥ ±1KV	0/3 x 1 (PASS)
Latch-Up	Vtr(+) ≥ 1.5 * Vcc Vtr(-) ≤ -0.5 * Vcc Itr(+) ≥ 100mA Itr(-) ≤ -100mA		0/6 x 1 (PASS)

Moisture Sensitivity Level Test Flow & Condition:

Electrical Test → SAT → TC (-65°C ~ +150°C, 5Cycles) → Bake (125°C, 24Hrs) → Soak Level III (30°C, 60%R.H., 192Hrs) → Convection Reflow (260 ±5/-0°C, 0~20Secs, 3Cycles) → Electrical Test → SAT

Test Item	Test Method			Result (F/S.S)
	Reference Standard	Test Condition & Criteria	Sample	
Latch-Up	AEC Q100-004	$V_{tr(+)} \geq 1.5 * V_{cc}$ $V_{tr(-)} \leq -0.5 * V_{cc}$ $I_{tr(+)} \geq 100mA$ $I_{tr(-)} \leq -100mA$	6ea	0/6

Table 6. Latch-Up test Condition and Result

4. CONCLUSION

Reliability test is to ensure the ability of a product in order to perform a required function under specific conditions for a certain period of time. Through those tests, the devices of potential failure can be screened out before shipping to the customer. At the same time, the test results are fed back to process, design and other related departments for improving product quality and reliability.

According to the life time test data, *the short-term 48Hrs failure rate (= the normal operation 0-1 year) of AS4C512M8D3LC is equal to 0 DPM at $T_a=55^\circ C$ and $V_{cc}=1.35V$ with 60% confidence level AND the long-term 1000Hrs failure rate (= the normal operation 1-10 year) of AS4C512M8D3LC is equal to 15 FIT at $T_a=55^\circ C$ and $V_{cc}=1.35V$ with 60% confidence level.* The results of environmental test, ESD test and latch-up test also ensure that AS4C512M8D3LC is manufactured under a precise control of quality work by Alliance and its subcontractors. ***Thus, this experiment based on the Alliance reliability test standard for above test items can all pass.***

With the extensive research and development activities and the cooperation of all departments, Alliance continuously sets and maintains higher standard of quality and reliability to satisfy the future demand of its customers.