

Reliability Qualification Report

for

**4GB eMMC with Pb/Halogen Free
(Industrial)**

Issued Date: July 23, 2025

Reliability Qualification Summary

The material in this report is confidential. It is prepared to assist in the qualification of Alliance Memory product. It is declassified for the customer internal use only and may be modified to meet the needs of specific customer. It also serves as a record of full qualification according to JESD47 requirements. Additionally, the package details (material set, assembly location, etc.) are specific to the qual vehicle used for the qualification. Alternate material sets and assembly locations may be qualified for the product. Production material can be assembled with any qualified material set and at any qualified assembly location. Tests are performed in accordance with relevant JEDEC specifications.

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2. Product Information

Product Description

Product Part Number:	ASFC4G31MA-51BIN
Decryption:	4GB, 3.3V, e-MMC Flash
Package:	Plastic 153-Ball (13x11.5x0.8mm) BGA Package
Assembly Location:	SFA Korea
Molding Compound:	RoHS Compliant Epoxy Resin
Flammability:	NFPA Level 0
Substrate / Lead Frame:	Laminate Substrate
Die Attachment:	Film
Lead Finish:	SAC1205+Ni
Bond Wire:	Au

Thermal Parameter

ΘJA:	39.4 °C/W		
ΨJT:	0.45 °C/W		
Est. Field Temperature:	40°C	Life Test Temperature:	125°C
Est. DC Field Current:	ICC=110mA, ICCQ=150mA	Life Test Dynamic Current:	ICC=110mA, ICCQ=150mA
Est. Field Voltage:	VCC=3.3V, VCCQ=1.8V	Life Test Voltage:	VCC=3.6V, VCCQ=1.95V
Est. Field Power Dissipation:	0.633W	Est. Stress Power Dissipation:	0.688W
Est. Field Tj:	64.9°C	Est. Stress Tj:	152.1°C

Die Information

Number of Dies: 1+1

	Die#1 (NAND)	Die#2 (Controller)
Process:	16nm	—
Type:	MLC NAND	e-MMC 5.1 Controller
Density:	32Gb	—

3. Summary of Stress Test Result

eMMC Qualification Result

Test Items	Condition	Sample Size	Num of Lot	Result
ACC PC	Accelerated Pre-Condition Bake 125°C, 24hrs, Soak 60°C/70%RH 72hrs, Reflow 260°C 3 times ^{*1}	240	2	PASS
ACC PC + TC	Accelerated Pre-Condition + TC -65 to 150°C, 200Cycles ^{*1}	60	2	PASS
ACC PC + HAST	Accelerated Pre-Condition + HAST 130°C/85%RH, Vcc 3.6V, 96hrs ^{*1}	60	2	PASS
PC	Pre-Condition Bake 125°C, 24hrs, Soak 30°C/60%RH 192hrs, Reflow 260°C 3 times ^{*2}	214	3	PASS
PC+TC	Pre-Condition + TC -65 to 150°C, 500 Cycles ^{*2}	69	3	PASS
PC+HAST	Pre-Condition + HAST 110°C/85%RH, Vcc 3.6V, 264hrs ^{*2}	74	3	PASS
PC+uHAST	Pre-Condition + unbiased HAST 130°C/85%RH, 96hrs ^{*2}	70	3	PASS
HTS	150°C, 1000hrs ^{*2}	74	3	PASS
ESD-HBM	100pF, 1500Ω, ±2000V	15	1	PASS
ESD-CDM	1KV ^{*2}	18	1	PASS
Latch-up	±200mA	6	1	PASS

Note:

*1 Results from 4GB eMMC in 153-Ball (13x11.5x0.8mm) BGA Package, accel condition

*2 Results from 4GB eMMC in 153-Ball (13x11.5x0.8mm) BGA Package

NAND Flash Product Reference Data

Test Items	Condition	Sample Size	Num of Lot	Result
ELFR	3.7V, 125°C, 48hrs	1000	3	PASS
HTOL	3.7V, 125°C, 1008hrs	231	3	PASS
LTOL	3.7V, -10°C, 1008hrs	76	3	PASS
NVCE	3.6V, Pre EW 3Kcycle 85°C	231	3	PASS
	3.6V, Pre EW 3Kcycle 25°C	231	3	PASS
LTDDR	3.6V, 25°C, 3K P/E Cycles + RTOL 3.6V, 25°C 504hrs * ³	116	3	PASS
PCHTDR	3.6V, 85°C, 300 P/E Cycles + DRB; 10Yrs@55°C * ³	231	3	PASS
	3.6V, 85°C, 3K P/E Cycles + DRB; 1Yrs@55°C * ³			
	3.6V, 85°C, 3K P/E Cycles + DRB; 10Yrs@55°C * ⁴			
	3.6V, 85°C, 30K P/E Cycles + DRB; 1Yrs@55°C * ⁴			
Cycled Read Disturb	3.6V, 85°C, 3K P/E Cycles + 10K Read 25°C * ³	231	3	PASS
	3.6V, 85°C, 3K P/E Cycles + 100K Read 25°C * ⁴			

*3: MLC Mode

*4: pSLC Mode

Reliability Tests Performed per Specification Requirements

Stress	Condition	Specification Reference
ESD HBM	N/A	JS001
Latch Up	+/- 200mA	JESD78
ELFR, HTOL	3.6V, 125°C	JESD22-A108
LTOL	-40°C, 3.6V	JESD22-A108
NVCE	85°C, 3.6V, 25°C, 3.6V	JESD47 / JESD22-A117
PCHTDR	85°C, 3.6V, DRB 100h, 125°C	JESD47 / JESD22-A117
LTDDR	25°C, 3.6V, 25°C RTOL, 500h	JESD47 / JESD22-A117
Cycled Read Disturb	85°C, 3.6V, 100K Read Disturb, 25C	JESD47 / JESD22-A117
Preconditioning (PC)	PC2/260°C, +0°C/-5°C	J-STD-020
PC + Temp Cycle	PC2/260°C, -40°C/150°C	JESD22-A104
PC + HAST	PC2/260°C, Biased, 110°C/85% RH	JESD22-A110
PC + uHAST	PC2/260°C, Unbiased, 130°C/85% RH	JESD22-A118
High Temp Bake	150°C	JESD22-A103
ESD CDM	N/A	JS002