Reliability Qualification Report

for

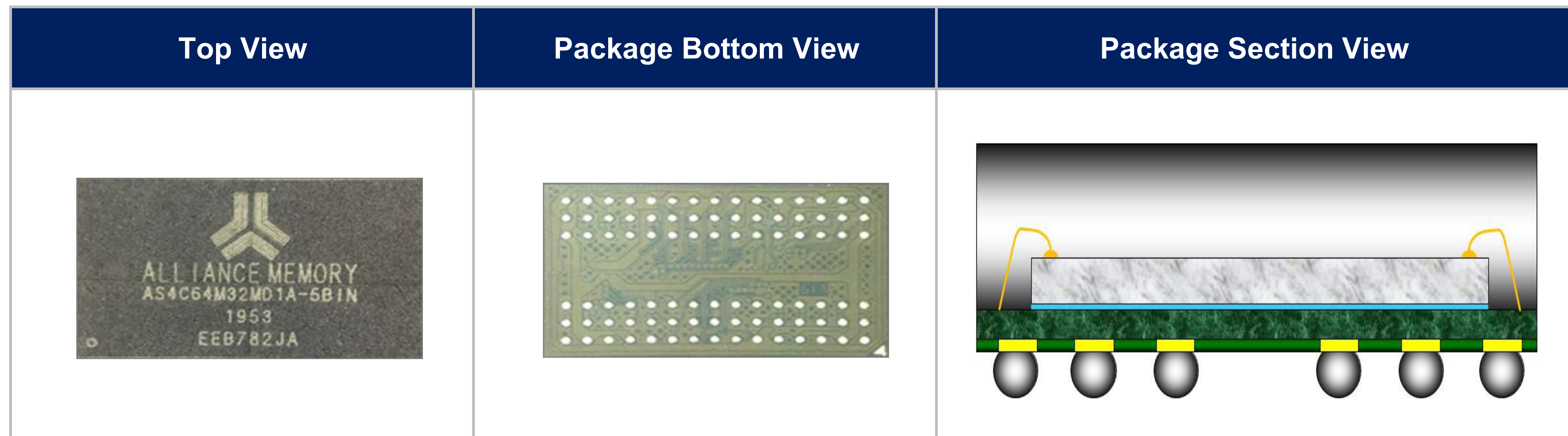
LPDDR1 SDRAM with Pb/Halogen Free

(46nm 2Gb LPDDR1 SDRAM AS4C64M32MD1A-5BIN)

Alliance Memory, Inc. 12815 NE 124th st. STE#D, Kirkland, WA 98034 TEL: 425-898-4456 FAX: 425-896-8628
Alliance Memory Inc. reserves the right to change products or specification without notice

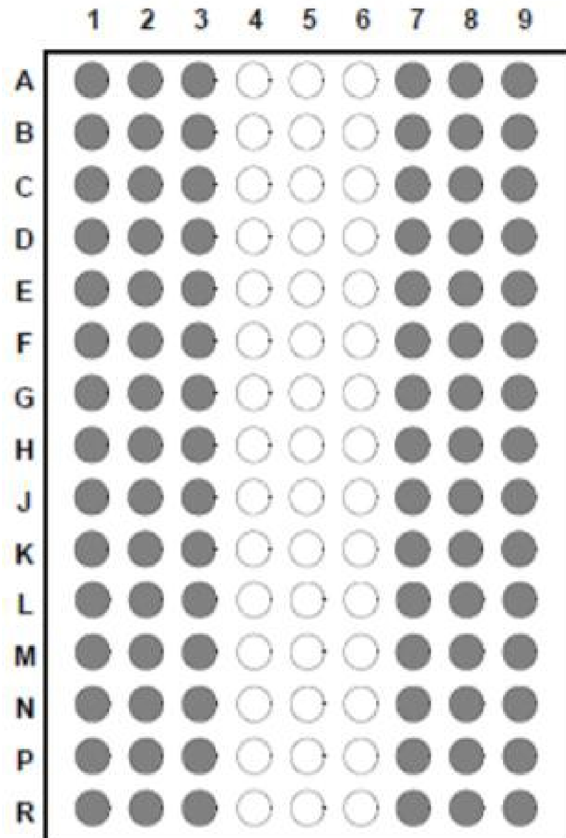
◆ Product Information

Organization	Operating Temp.	Product Code	VCC Range	Package Type
2G LPDDR1 DRAM	-40°C ~ 85°C	AS4C64M32MD1A-5BIN	1.7V ~ 1.95V	FBGA 90B (8.0 x 13.0 x 1.0mm)



Ball Configuration

Top View
(Balls seen through the package)



Pin Description

90-Ball (6x15) CSP						
	1	2	3	7	8	9
A	VSS	DQ31	VSSQ	VDDQ	DQ16	VDD
B	VDDQ	DQ29	DQ30	DQ17	DQ18	VSSQ
C	VSSQ	DQ27	DQ28	DQ19	DQ20	VDDQ
D	VDDQ	DQ25	DQ26	DQ21	DQ22	VSSQ
E	VSSQ	DQS3	DQ24	DQ23	DQS2	VDDQ
F	VDD	DM3	NC	A13	DM2	VSS
G	CKE	CK	$\overline{CK}$	$\overline{WE}$	$\overline{CAS}$	$\overline{RAS}$
H	A9	A11	A12	$\overline{CS}$	BA0	BA1
J	A6	A7	A8	A10/AP	A0	A1
K	A4	DM1	A5	A2	DM0	A3
L	VSSQ	DQS1	DQ8	DQ7	DQS0	VDDQ
M	VDDQ	DQ9	DQ10	DQ5	DQ6	VSSQ
N	VSSQ	DQ11	DQ12	DQ3	DQ4	VDDQ
P	VDDQ	DQ13	DQ14	DQ1	DQ2	VSSQ
R	VSS	DQ15	VSSQ	VDDQ	DQ0	VDD

Test Item	Reference	Test Condition	Stress Duration	Sample Size	No. of failure	Judgment
ELFR	JESD22 A108	Dynamic Stress, 125°C	168 hrs	1000ea	0	**Pass**
HTOL	JESD22 A108	Dynamic Stress, 125°C	1000 hrs	387ea	0	**Pass**
LTOL	JESD22 A108	Dynamic Stress, -25°C	1000 hrs	387ea	0	**Pass**

Note : ELFR (Early Life Failure Rate)

HTOL (High Temperature Operating Life)

LTOL (Low Temperature Operating Life)

Test Item	Reference	Test Condition	Stress Duration	Sample Size	No. of failure	Judgment
MSL (Level 3)	JESD22 A113	30°C, 60% RH	192 hrs	154ea	0	**Pass**
T/C (A)	JESD22 A104	-55°C ~ 125°C	1000 cycles	77ea	0	**Pass**
HTSL	JESD22 A103	150°C	1000 hrs	77ea	0	**Pass**
UHAST(A)	JESD22 A118	130°C, 85% RH	96 hrs	77ea	0	**Pass**

Note : 1. “(A)” means the test is done after Precondition.

2. MSL (Moisture Sensitivity Level)

HTSL (High Temperature Storage Life)

T/C (Temperature Cycle)

UHAST (Unbiased Highly Accelerated Stress Test)

Test Item	Reference	Test Result	Sample Size	Judgment
HBM	Mil-STD 883D	Passed 2000 V	9ea	**Pass**
CDM	JESD22 C101	Passed 500 V	3ea	**Pass**
Latch-up	JESD78	Passed ±150 mA	9ea	**Pass**

Note : HBM(Human Body Model), CDM(Charge Device Model)

<table>
<tr><th colspan="2">Test Item</th><th>Ea</th><th>Result</th><th>Remark</th></tr>
<tr><td rowspan="2">SDRAM</td><td>ELFR</td><td rowspan="2">0.5</td><td>20.7 FIT</td><td rowspan="2">60%
confidence Level</td></tr>
<tr><td>HTOL</td><td>6.4 FIT</td></tr>
</table>

The method of determining a product's failure rate is through the use of accelerated high temperature operation life tests. performed.

1) Temperature Acceleration is determined by TAF = exp[(Ea/k x 1/Tu-1/Ts)]
   K is Boltzmann's constant(8617e-5 ev/K, Ea is the activation energy in eV

2) Voltage Acceleration is described by VAF = exp[B x (Vs – Vu)]
   B is the voltage acceleration term in 1/V.

3) Acceleration Factor = TAF(t) * AF
   Long time Failure Rate (1~10 years) for 1 technology is gauged by a Failure In Time (FIT) calculation based on accelerated stress data.
   The units for FIT are failures per Billion device hours.

4) Mean Time To Failure (MTTF) = (1/FITs) x 10e9 @ 60% confidence level.