



ATMEL CORPORATION

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AT-29C512 PEROM RELIABILITY DATA

- 125°C DYNAMIC OPERATING LIFE TEST
- CYCLE TEST
- 200°C RETENTION BAKE
- 125°C DYNAMIC LIFE TEST (PLASTIC)
- 150°C RETENTION BAKE (PLASTIC)
- 15 PSIG PRESSURE POT
- 85°C/85% RELATIVE HUMIDITY OPERATING LIFE TEST
- EXTENDED TEMPERATURE CYCLING
- EXTENDED THERMAL SHOCK

JULY 2004

2325 Orchard Parkway San Jose CA. 95131

AT-29C512

125°C DYNAMIC OPERATING LIFE TEST

<u>LOT NUMBER</u>	<u>DATE CODE</u>	<u>SAMPLE SIZE</u>	<u>TOTAL CKT-HRS(K)</u>	<u>NUMBER OF FAILURES</u>
234409	2D9303	80	80.0	0
B3B0684	3B9327	78	78.0	0
4A0927	4A9422	79	79.0	0
4A2182	4A9426	90	90.0	0
4D0262	4D9449	253	632.5	0
5G1621	5G9548	55	55.0	0

FAILURE RATETOTAL DEVICE HOURS

1,014,500 DEVICE HOURS

BEST ESTIMATE λ = 0.07% PER 1000 HOURS50°C AMBIENTEXTRAPOLATION TO 50°C VIA
ARRHENNIUS
EQUATION AND ACTIVATION ENERGY OF
0.5eV λ = 0.002% PER 1,000 HOURS (24
FITS)CONFIDENCE ESTIMATE λ 60 = 0.003% PER 1000 HOURS
60% CONFIDENCE (30 FITS) λ 90 = 0.008% PER 1000 HOURS
90% CONFIDENCE (76 FITS)

Data cycling followed by 200°C bakes were performed to determine the device endurance. All addresses were cycled the specified number of times. The parts were baked and then verified. The results of the cycling tests are shown below. No device failures have been found.

CYCLE TEST RESULTS OF AT-29C512

<u>Lot Number</u>	<u>Date Code</u>	<u>Sample Size</u>	<u>No. of Cycles</u>	<u>No. of Failures</u>	<u>Bake Temp</u>	<u>Bake Time</u>
234409 hrs	2D9303	80	10,000	0	200°C	176
B3B0684 hrs	3B9327	78	10,000	0	200°C	176
4A0927 hrs	4A9422	28	10,000	0	200°C	176
5G1621 hrs	5G9548	55	10,000	0	200°C	176

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200°C RETENTION BAKE

<u>LOT NUMBER</u>	<u>DATE CODE</u>	<u>SAMPLE SIZE</u>	<u>NUMBER OF FAILURES</u>			
			<u>24</u>	<u>162</u>	<u>500</u>	<u>1000 HRS</u>
234409	2D9303	80	0	0	0	0
3A0680B	3B9319	44	0	0	0	0
3B1470	3C9340	79	0	0	0	0
4A0927	4A9422	79	0	0	0	0
5G1621	5G9548	53	0	0	0	0

FAILURE RATETOTAL DEVICE HOURS

335,000 DEVICE HOURS

BEST ESTIMATE $\lambda = 0.21\%$ PER 1,000 HOURS50°C AMBIENTEXTRAPOLATION TO 50°C VIA ARRHENNIUS
EQUATION AND ACTIVATION ENERGY OF

0.5eV

 $\lambda = 0.001\%$ PER 1,000 HOURS (7 FITS)CONFIDENCE ESTIMATE
 $\lambda_{60} = 0.001\%$ PER 1,000 HOURS
60% CONFIDENCE (9 FITS)
 $\lambda_{90} = 0.002\%$ PER 1,000 HOURS
90% CONFIDENCE (24 FITS)

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PLASTIC PACKAGE

125°C DYNAMIC OPERATING LIFE TEST

<u>LOT NUMBER</u>	<u>DATE CODE</u>	<u>PKG</u>	<u>SAMPLE SIZE</u>	<u>TOTAL CKT-HRS(K)</u>	<u>NUMBER OF FAILURES</u>
234179	2D9252	32 PLCC	77	77.0	0
233780	2D9304	32 PDIP	79	79.0	0
233716B	2D9251	32 PLCC	77	77.0	0
234035BB	2D9251	32 PLCC	80	80.0	0
A3B0684B	3B9336	32 PLCC	500	500.0	0
4A2182	4A9426	32 PDIP	90	90.0	0
5G1621	5G9552	32 PLCC	205	205.0	0
5C2412	5C9551	32 TSOP	100	100.0	0
6F2345	6F9631	32 PLCC	77	77.0	0
1H0050-1	1H0208	32 PLCC	94	94.0	0

FAILURE RATETOTAL DEVICE HOURS

1,279,000 DEVICE HOURS

BEST ESTIMATE $\lambda = 0.05\%$ PER 1,000 HOURS50°C AMBIENTEXTRAPOLATION TO 50°C VIA ARRHENNIUS
EQUATION AND ACTIVATION ENERGY OF

0.5eV

 $\lambda = 0.002\%$ PER 1,000 HOURS (18 FITS)CONFIDENCE ESTIMATE
 $\lambda_{60} = 0.002\%$ PER 1,000 HOURS
60% CONFIDENCE (24 FITS)
 $\lambda_{90} = 0.006\%$ PER 1,000 HOURS
90% CONFIDENCE (61 FITS)

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PLASTIC PACKAGE

150°C RETENTION BAKE

<u>LOT NUMBER FAILURES</u>	<u>DATE CODE</u>	<u>PKG</u>	<u>SAMPLE SIZE</u>	<u>TOTAL CKT-HRS (K)</u>	<u>NUMBER OF</u>
233030	2C9238	32 TSOP	79	79.0	0
233643B	2D9248	32 PLCC	80	80.0	0
234178	2D9252	32 P-DIP	80	80.0	0
234179	2D9252	32 PLCC	154	154.0	0
233780	2D9304	32 PDIP	77	77.0	0
233716B	2D9251	32 PLCC	80	80.0	0
3A0434	3B9317	32 PDIP	80	80.0	0
234035BB	2D9251	32 PLCC	80	80.0	0
A3B0684B	3B9336	32 PLCC	62	62.0	0
5G1621	5G9552	32 PLCC	45	45.0	0
5C2412	5C9551	32 TSOP	191	191.0	0
6F2345	6F9631	32 PLCC	77	77.0	0
1H00501-	1H0208	32 PLCC	92	92.0	0

FAILURE RATETOTAL DEVICE HOURS

1,177,000 DEVICE HOURS

BEST ESTIMATE $\lambda = 0.06\%$ PER 1,000 HOURS50°C AMBIENTEXTRAPOLATION TO 50°C VIA ARRHENNIUS
EQUATION AND ACTIVATION ENERGY OF

0.5eV

 $\lambda = 0.0008\%$ PER 1,000 HOURS (8 FITS)CONFIDENCE ESTIMATE $\lambda_{60} = 0.001\%$ PER 1,000 HOURS

60% CONFIDENCE (11 FITS)

 $\lambda_{90} = 0.003\%$ PER 1,000 HOURS

90% CONFIDENCE (28 FITS)

AT-29C512
 PLASTIC PACKAGE
PRESSURE POT TEST

<u>DATE CODE</u> <u>HOURS</u>	<u>PACKAGE TYPE</u>	<u>SAMPLE SIZE</u>	<u>NUMBER OF FAILURE</u> <u>AT INDICATED</u>		
			(24)	(48)	(72)
(96)					
0 2D9252	32 PLCC	90	0	0	0
0 2D9304	32 PDIP	90	0	0	0
0 3B9336	32 PLCC	83	0	0	0
0 4A9426	32 PDIP	48	0	0	0
0 5G9552	32 PLCC	45	0	0	0
0 5C9551	32 TSOP	154	0	0	0
0 6F9631	32 PLCC	76	0	0	0

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PLASTIC PACKAGE

85°C/85% RELATIVE HUMIDITY OPERATIVE LIFE TEST

<u>LOT NUMBER</u>	<u>DATE CODE</u>	<u>PACKAGE TYPE</u>	<u>SAMPLE SIZE</u>	<u>NUMBER OF FAILURES AT INDICATED HOURS</u>		
				(168)	(500)	(1000)
233780	2D9304	32 P-DIP	77	0	0	0
4A2182	4A9426	32 P-DIP	77	0	0	0
5C2412	5C9551	32 TSOP	18	0	0	0
5G1621B	5G9552	32 PLCC	45	0	0	0

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PLASTIC PACKAGE

EXTENDED TEMPERATURE CYCLING

-65°C to +150°C PLCC/TSOP/SOIC/PDIP
-55°C to +125°C CBGA

<u>DATE</u> <u>CODE</u>	<u>PACKAGE</u> <u>TYPE</u>	<u>SAMPLE</u> <u>SIZE</u>	<u>NUMBER</u> <u>OF CYCLING</u>	<u>NUMBER</u> <u>OF FAILURES</u>
6F9631	32 PLCC	77	1000	0

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PLASTIC PACKAGE

EXTENDED THERMAL SHOCK

-55°C TO +125°C

<u>DATE</u> <u>CODE</u>	<u>PACKAGE</u> <u>TYPE</u>	<u>SAMPLE</u> <u>SIZE</u>	<u>NUMBER</u> <u>OF CYCLING</u>	<u>NUMBER</u> <u>OF FAILURES</u>
6F9631	32 PLCC	77	1000	0