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AT-28C64B PEROM RELIABILITY DATA

-150°C OPERATING LIFE TEST

-200°C RETENTION BAKE

-CYCLE TEST

-125°C OPERATING LIFE TEST (PLASTIC)

-150°C RETENTION BAKE (PLASTIC)

-15 PSIG PRESSURE POT

-85°C/85% RELATIVE HUMIDITY OPERATING LIFE TEST

\* This report was generated from AT-28C64B reliability testing. This data is applicable to the following device types due to same technology grouping as defined in MIL-M-38535 Appendix A:

AT-28C256

AT-28HC64B

APRIL 2005

2325 Orchard Parkway San Jose CA. 95131

## AT-28C64B

150°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>
3B0910	3B9327	78	78.0	0
3C1449	3C9348	78	78.0	0
4A1345	4A9424	80	200.0	0
4C2051	4C9449	78	78.0	0
4D1708	4D9507	80	200.0	0
5A1542	5A9520	80	200.0	0
6L0014-1	6L9629	480	480.0	0
6C1822A	6C9646	200	200.0	0
6C2138	6C9641	80	80.0	0
6M0064-3	6M9652	80	80.0	0
6D1565-9	6D9702	80	80.0	0
6D1584	6D9704	579	579.0	0
6D1820-2	6D9705	80	80.0	0
6N8531	6N9708	80	80.0	0

FAILURE RATETOTAL DEVICE HOURS

2,493,000 DEVICE HOURS

BEST ESTIMATE $\lambda = 0.03\%$  PER 1,000 HOURS50°C AMBIENTEXTRAPOLATION TO 50°C VIA ARRHENNIUS  
EQUATION AND ACTIVATION ENERGY OF  
0.5eV $\lambda = 0.0004\%$  PER 1,000 HOURS (4 FITS)CONFIDENCE ESTIMATE $\lambda$  60 = 0.0005% PER 1,000 HOURS  
60% CONFIDENCE (5 FITS) $\lambda$  90 = 0.001% PER 1,000 HOURS  
90% CONFIDENCE (13 FITS)

## AT-28C64B

200°C DATA RETENTION BAKE

<u>LOT NUMBER</u>	<u>DATE CODE</u>	<u>SAMPLE SIZE</u>	<u>TOTAL CKT-HRS (K)</u>	<u>NUMBER OF OF FAILURES</u>
3C1449	3C9348	78	78.0	0
4A1345	4A9424	80	80.0	0
4D1708	4D9507	80	80.0	0
5B0417	5B9531	80	80.0	0
5C1544	5C9539	79	79.0	0
5A1542	5A9520	79	79.0	0
6L0014-1	6L9629	79	79.0	0
E6C2138	6C9641	79	79.0	0
6D1565-9	6D9702	80	80.0	0
6D1584	6D9704	80	80.0	0
6D1820-2	6D9705	80	80.0	0
6N8531	6N9708	80	80.0	0

FAILURE RATETOTAL DEVICE HOURS

954,000 DEVICE HOURS

BEST ESTIMATE $\lambda = 0.07\%$  PER 1,000 HOURS50°C AMBIENTEXTRAPOLATION TO 50°C VIA ARRHENNIUS  
EQUATION AND ACTIVATION ENERGY OF  
0.5eV $\lambda = 0.0003\%$  PER 1,000 HOURS (3 FITS)CONFIDENCE ESTIMATE $\lambda$  60 = 0.0003% PER 1,000 HOURS  
60% CONFIDENCE (3 FITS) $\lambda$  90 = 0.0008% PER 1,000 HOURS  
90% CONFIDENCE (8 FITS)

Data cycling followed by 200°C bakes were performed to determine the device endurance. Each address was byte cycled through all addresses. 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-28C64B

<u>LOT BAKE NUMBER TIME</u>	<u>DATE CODE</u>	<u>SAMPLE SIZE</u>	<u>NO. OF BYTE CYCLE</u>	<u>NO. OF FAILURES</u>	<u>BAKE TEMP</u>	
3B0910 hrs	3B9327	80	10,000	0	200°C	176
3C1449 hrs	3C9348	78	10,000	0	200°C	176
4A1345 hrs	4A9424	80	10,000	0	200°C	176
4C2051 hrs	4C9449	78	10,000	0	200°C	176
4D1708 hrs	4D9507	80	10,000	0	200°C	176
5A1542 hrs	5A9520	80	100,000	0	200°C	176

AT-28C64B

PLASTIC PACKAGE

125°C DYNAMIC OPERATING LIFE TEST

LOT OF <u>NUMBER FAILURES</u>	DATE <u>CODE</u>	<u>PKG</u>	SAMPLE <u>SIZE</u>	TOTAL <u>CKT-HRS (K)</u>	NUMBER <u>OF</u>
3B0910B1	3B9329	32 PLCC	75	75.0	0
4A2050	4A9422	32 PLCC	261	261.0	0
6L0014-3	6L9630	28 PDIP	198	198.0	0
7K5050	7K9734	28 TSOP	199	199.0	0
7A3015-1	7A9807	28 SOIC	100	100.0	0
8G3093-3	8G9837	28 PDIP	100	100.0	0

FAILURE RATETOTAL DEVICE HOURS

933,000 DEVICE HOURS

BEST ESTIMATE $\lambda$  = 0.07% PER 1,000 HOURS50°C AMBIENT

EXTRAPOLATION TO 50°C VIA  
ARRHENNIUS EQUATION AND  
ACTIVATION ENERGY OF 0.5eV  
 $\lambda$  = 0.003% PER 1,000 HOURS (25  
FITS)

CONFIDENCE ESTIMATE

$\lambda$  60 = 0.004% PER 1,000 HOURS  
60% CONFIDENCE (33 FITS)  
 $\lambda$  90 = 0.01% PER 1,000 HOURS  
90% CONFIDENCE (84 FITS)

AT-28C64B  
 PLASTIC PACKAGE  
150°C RETENTION BAKE

LOT OF <u>NUMBER FAILURES</u>	DATE <u>CODE</u>	SAMPLE <u>PKG</u>	SAMPLE <u>SIZE</u>	TOTAL <u>CKT-HRS (K)</u>	NUMBER <u>OF</u>
3B0910B1	3B9329	32 PLCC	77	77.0	0
6L0014-3	6L9630	28 PDIP	128	128.0	0
7K5050	7K9734	28 TSOP	290	290.0	0
7A3015-1	7A9807	28 SOIC	100	100.0	0
8G3093-3	8G9837	28 PDIP	300	300.0	0
1E0610	1E0122	28 PDIP	50	50.0	0

FAILURE RATE

<u>TOTAL DEVICE HOURS</u>		945,000 DEVICE HOURS
<u>BEST ESTIMATE</u>	$\lambda$	= 0.07% PER 1,000 HOURS
<u>50°C AMBIENT</u>		EXTRAPOLATION TO 50°C VIA ARRHENNIUS EQUATION AND ACTIVATION ENERGY OF 0.5eV
	$\lambda$	= 0.001% PER 1,000 HOURS (11 FITS)
<u>CONFIDENCE ESTIMATE</u>	$\lambda$	60 = 0.001% PER 1,000 HOURS 60% CONFIDENCE (14 FITS)
	$\lambda$	90 = 0.004% PER 1,000 HOURS 90% CONFIDENCE (35 FITS)

AT-28C64B  
 PLASTIC PACKAGE  
PRESSURE POT TEST

<u>DATE CODE</u>	<u>PKG TYPE</u>	<u>SAMPLE SIZE</u>	<u>NUMBER OF FAILURES AT INDICATED HOURS</u>			
			( 24 )	( 48 )	( 72 )	( 96 )
3B9329	32 PLCC	89	0	0	0	0
4D9508	28 SOIC	116	0	0	0	0
7K9734	28 TSOP	200	0	0	0	0
7A9807	28 SOIC	50	0	0	0	0
1E0122	28 PDIP	50	0	0	0	0

AT-28C64B

PLASTIC PACKAGE

85°C/85% RELATIVE HUMIDITY OPERATING LIFE TEST

<u>LOT NUMBER HOURS</u>	<u>DATE CODE</u>	<u>PACKAGE TYPE</u>	<u>SAMPLE SIZE</u>	<u>NUMBER OF FAILUES AT INDICATED</u>	
(1000)				(168)	(500)
4D1364 0	4D9508	28 SOIC	45	0	0
7K5050 0	7K9734	28 TSOP	78	0	0