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AT-29C020 PEROM RELIABILITY DATA

- 125°C DYNAMIC OPERATING LIFE TEST
- 200°C RETENTION BAKE
- CYCLE TEST
- 125°C DYNAMIC OPERATING LIFE TEST (PLASTIC)
- 150°C RETENTION BAKE (PLASTIC)
- 15 PSIG PRESSURE POT
- 85°C/85% RELATIVE HUMIDITY OPERATING LIFE TEST
- 131°C/85% RELATIVE HUMIDITY HAST TEST
- EXTENDED TEMPERATURE CYCLING
- EXTENDED THERMAL SHOCK

* This report was generated from AT29C020 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-29C010A

AT-29C040A

JULY 2006

2325 Orchard Parkway San Jose CA. 95131

AT-29C020

125°C DYNAMIC OPERATING LIFE TEST

LOT NUMBER	DATE CODE	SAMPLE SIZE	TOTAL CKT-HRS(K)	NUMBER OF FAILURES
3D1140	3D9403	80	80.0	0

FAILURE RATE

TOTAL DEVICE HOURS — 80,000 DEVICE HOURS

BEST ESTIMATE — λ = 0.8% PER 1000 HOURS

50°C AMBIENT — EXTRAPOLATION TO 50°C VIA ARRHENNIUS EQUATION AND ACTIVATION ENERGY OF O.5eV
λ = 0.03% PER 1,000 HOURS (297 FITS)

CONFIDENCE ESTIMATE — λ 60 = 0.04% PER 1000 HOURS
60% CONFIDENCE (390 FITS)
λ 90 = 0.10% PER 1000 HOURS
90% CONFIDENCE (990 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 bakes and then verified. The results of the cycling tests are shown below. No device failures have been found.

CYCLE TEST RESULTS OF AT-29C020

LOT NUMBER	DATE CODE	SAMPLE SIZE	NO. OF CYCLES	NO. OF FAILURES	BAKE TEMP	BAKE TIME
B5F0201	5F9526	50	10,000	0	200°C	176 hrs

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200°C RETENTION BAKE

LOT NUMBER	DATE CODE	SAMPLE SIZE	NUMBER OF FAILURES 24	168	500	1000 HRS
5F0125	5F9526	70	0	0	0	0
5F0201	5F9526	70	0	0	0	0
B5F0201	5F9526	70	0	0	0	0

FAILURE RATE

TOTAL DEVICE HOURS		210,000 DEVICE HOURS
BEST ESTIMATE	λ =	0.33% PER 1,000 HOURS
50°C AMBIENT		EXTRAPOLATION TO 50°C VIA ARRHENNIUS EQUATION AND ACTIVATION ENERGY OF 0.5eV
	λ =	0.001% PER 1,000 HOURS (11 FITS)
CONFIDENCE ESTIMATE	λ 60 =	0.002% PER 1,000 HOURS 60% CONFIDENCE (15 FITS)
	λ 90 =	0.004% PER 1,000 HOURS 90% CONFIDENCE (37 FITS)

AT-29C020

PLASTIC PACKAGE

125°C DYNAMIC OPERATING LIFE TEST

LOT NUMBER	DATE CODE	SAMPLE SIZE	TOTAL CKT-HRS(K)	NUMBER OF FAILURES
5F0125	5F9529	94	94.0	0
5F0432	5F9529	252	252.0	0
5B0038	5F9525	100	100.0	0
5F0805	5F9532	549	549.0	0
5F0525	5F9532	241	241.0	0
5F0627	5F9534	194	194.0	0
5G0847	5G9546	100	100.0	0
5G0621	5G9545	200	200.0	0
5H1766	5H9611	115	115.0	0
5H1764-1	5H9611	100	100.0	0
6B1608A	6B9628	80	80.0	0
7E2626-1	7E9716	100	77.0	0
7E2261-1	7E9717	250	250.0	0
7E3209-1	7E9719	250	250.0	0
7E2798-1	7E9720	250	250.0	0
7G2858	7G9735	164	164.0	0
8E1696	8E9815	300	300.0	0
8E1979	8E9817	500	500.0	0
8G0404-1	8G9817	100	100.0	0
8E4468	8E9828	400	400.0	0
9H0440	9H0014	100	100.0	0
0E2164	0E0013	100	100.0	0
0H3070-1	0H0047	100	100.0	0
1E4724	1E0131	90	90.0	0
1H2552	1H0144	100	100.0	0
2E1101	2E0210	100	100.0	0

FAILURE RATE

TOTAL DEVICE HOURS — 4,849,000 DEVICE HOURS

BEST ESTIMATE — λ = 0.01% PER 1000 HOURS

50°C AMBIENT — EXTRAPOLATION TO 50°C VIA ARRHENNIUS EQUATION AND ACTIVATION ENERGY OF O.5eV
λ = 0.0005% PER 1,000 HOURS (5 FITS)

CONFIDENCE ESTIMATE — λ 60 = 0.0006% PER 1000 HOURS
60% CONFIDENCE (6 FITS)
λ 90 = 0.001% PER 1000 HOURS
90% CONFIDENCE (16 FITS)

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PLASTIC PACKAGE

150°C RETENTION BAKE

LOT NUMBER	DATE CODE	PACKAGE	SAMPLE SIZE	TOTAL CKT-HRS(K)	NUMBER OF FAILURES
5F0125	5F9521	32 TSOP	93	93.0	0
5F0432	5F9529	32 PLCC	252	252.0	0
5F0525	5F9532	32 PLCC	250	250.0	0
5F0805	5F9532	32 TSOP	213	213.0	0
5F0627	5F9534	32 PLCC	111	111.0	0
5G0847	5G9546	32 PLCC	149	149.0	0
5G0621	5G9545	32 PLCC	200	400.0	0
5H1764	5H9611	32 PLCC	189	189.0	0
6G3818	6G9651	32 PLCC	100	100.0	0
6H0962-1	6H9705	32 PLCC	205	205.0	0
7E2626-1	7E9716	32 PLCC	77	77.0	0
7E2261-1	7E9717	32 PLCC	313	313.0	0
7E3209-1	7E9719	32 PLCC	265	265.0	0
7E2798-1	7E9720	32 PLCC	265	265.0	0
7G2858	7G9735	32 PLCC	163	163.0	0
8E1657	8E9815	32 PLCC	50	50.0	0
8E1979-2	8E9817	32 PLCC	100	100.0	0
8G0400	8G9830	32 PDIP	160	160.0	0
8G3459	8G9832	32 PDIP	160	160.0	0
8G0404-1	8G9817	32 PLCC	100	100.0	0
8E4468	8E9828	32 PLCC	440	440.0	0
9A3094B	9A9917	32 PLCC	300	300.0	0
9H0440	9H0014	32 PLCC	100	100.0	0
0E2164	0E0013	32 PDIP	50	50.0	0
0H3070-1	0H0047	32 TSOP	50	50.0	0
1H2552	1H0144	32 TSOP	50	50.0	0
2E1101	2E0210	32 TSOP	50	50.0	0

FAILURE RATE

TOTAL DEVICE HOURS — 4,655,000 DEVICE HOURS

BEST ESTIMATE — λ = 0.02% PER 1000 HOURS

50°C AMBIENT — EXTRAPOLATION TO 50°C VIA ARRHENNIUS EQUATION AND ACTIVATION ENERGY OF O.5eV
λ = 0.0003% PER 1,000 HOURS (3 FITS)

CONFIDENCE ESTIMATE — λ 60 = 0.0004% PER 1000 HOURS
60% CONFIDENCE (4 FITS)
λ 90 = 0.001% PER 1000 HOURS
90% CONFIDENCE (9 FITS)

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PLASTIC PACKAGE

PRESSURE POT TEST

DATE CODE	PACKAGE TYPE	SAMPLE SIZE	NUMBER OF FAILURE AT INDICATED HOURS			
			(24)	(48)	(72)	(96)
5F0432	32 PLCC	80	0	0	0	0
5G9546	32 PLCC	153	0	0	0	0
5H9611	32 PLCC	77	0	0	0	0
6G9651	32 PLCC	160	0	0	0	0
7E9716	32 PLCC	144	0	0	0	0
7E9720	32 PLCC	400	0	0	0	0
7G9735	32 PLCC	212	0	0	0	0
8E9815	32 PLCC	50	0	0	0	0
8E9817	32 PLCC	50	0	0	0	0
8G9817	32 PLCC	50	0	0	0	0
9H9937	32 PLCC	100	0	0	0	0
0E0013	32 PDIP	50	0	0	0	0
0H0047	32 TSOP	50	0	0	0	0
1G0138	32 PLCC	48	0	0	0	0
1H0144	32 TSOP	50	0	0	0	0
2E0210	32 TSOP	50	0	0	0	0

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PLASTIC PACKAGE

85°C/85% RELATIVE HUMIDITY OPERATING LIFE TEST

LOT NUMBER	DATE CODE	PKG TYPE	SAMPLE SIZE	NUMBER OF FAILURES AT INDICATED HOURS		
				(168)	(500)	(1000)
5F0432	5B9529	32 PLCC	45	0	0	0
5G0847A	5G9546	32 PLCC	77	0	0	0
6G3818	6G9651	32 PLCC	45	0	0	0

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PLASTIC PACKAGE

131°C/85% RELATIVE HUMIDITY HAST TEST

LOT NUMBER	DATE CODE	PKG TYPE	SAMPLE SIZE	NUMBER OF FAILURES AT INDICATED HOURS (100)
5G0554	5G9544	32 PLCC	88	0
8E1657	8E9815	32 PLCC	50	0
8E1979-2	8E9817	32 PLCC	50	0
8G0404-1	8G9817	32 PLCC	50	0
0E2164	0E0013	32 PDIP	50	0
0H3070-1	0H0047	32 TSOP	50	0
1G0438	1G0136	32 PLCC	50	0
1H2552	1H0144	32 TSOP	50	0
2E1101	2E0210	32 TSOP	50	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

DATE CODE	PKG TYPE	SAMPLE SIZE	NUMBER OF CYCLES	NUMBER OF FAILURES
5F9529	32 PLCC	77	1000	0
5G0847	32 PLCC	77	1000	0
5H9611	32 PLCC	77	1000	0
6G9651	32 PLCC	80	1000	0
6H9705	32 PLCC	80	1000	0
7E9717	32 PLCC	100	1000	0
7E9720	32 PLCC	200	1000	0
7G9735	32 PLCC	154	1000	0
8E9815	32 PLCC	77	1000	0
8E9817	32 PLCC	77	1000	0
8E9828	32 PLCC	200	1000	0
9A9917	32 PDIP	100	1000	0
0E0013	32 PDIP	50	1000	0
0H0047	32 TSOP	50	1000	0
1H0144	32 TSOP	50	1000	0
2E0210	32 TSOP	50	1000	0

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PLASTIC PACKAGE

EXTENDED THERMAL SHOCK

-55°C TO +125°C

DATE CODE	PKG TYPE	SAMPLE SIZE	NUMBER OF CYCLES	NUMBER OF FAILURES
5F9529	32 PLCC	63	1000	0
5G0847	32 PLCC	77	1000	0
5H9611	32 PLCC	77	1000	0
6G9651	32 PLCC	79	1000	0
6H9705	32 PLCC	80	1000	0
7E9716	32 PLCC	77	1000	0
7E9717	32 PLCC	100	1000	0
7E9720	32 PLCC	200	1000	0
7E9735	32 PLCC	154	1000	0
8E9815	32 PLCC	77	1000	0
8E9817	32 PLCC	77	1000	0