



Microcontroller/AVR(35.5K) Reliability Data Package

Date: March 18th, 2005

From: Reliability Engineer

Subj.: Qualification By Similarity for Microcontrollers/AVR Products

Dear Valued Customer,

The following Microcontrollers/AVR devices are all fabricated using Atmel's **35.5K** process. For Qualification purposes, all of the following Atmel Microcontroller devices are covered by the above process:

w/1K byte Flash	w/2K byte Flash	w/4K byte Flash	w/8K byte Flash	w/12K byte Flash	w/16K byte Flash & Cell Prog.	w/32K & 40K byte Flash	w/64K byte Flash	w/128K byte Flash	w/256K byte Flash
Tiny13	Tiny24	Mega48	Mega8	90VC8544	Mega16	Mega32	Mega64	Mega128	Mega2560
	Tiny25	Tiny45	Mega8515		Mega162	Mega325	Mega645	Mega1280	Mega2561
	Tiny26		Mega8535		Mega169	Mega329	Mega649	Mega1281	
	Tiny2313		Mega88		Mega165	Mega406	Mega644		
					Mega168				

All of these devices are fabricated on the same process with same passivation, and implant levels. The devices vary in memory density and logic, therefore by qualifying the largest and/or most complex device also covers the qualification of smaller devices.

If you have any questions regarding this matter, please feel free to contact us. Once again, thank you for your interest in Atmel microcontroller products.



35.5K PROCESS QUALIFICATION DATA

ATMEL Device

1. # Samples Delivered: _____ Units
2. Product Qualification Policy
3. Die Fabrication Process Qualification Conditions
4. Die Reliability Test Data
 - Dynamic Operating Life Test
 - Data Retention Test
 - HAST Test
 - Temperature Cycling Test
 - Pressure Pot Test
 - ESD Data
 - Latchup Data
5. Technology General Information
6. Package Assembly Process Qualification
7. Assembly Material Information



ATMEL Justification for Qualification by Similarity

“ Qualification by similarity is a standard practice of all major IC suppliers whose product lines are as extensive and diverse as Atmel Corporation's. The general philosophy and practice of qualification by similarity is that product using the exact same materials and processing (defined as a Package Family) will contain the same level of random defects regardless of the final product. Product to product differences such as lead count and or die dimensions vs. package dimensions are addressed by selecting the 'worst case' package (with respect to these attributes) from the Package Family.

By qualifying the 'worst case' package from each Package Family at each assembly subcontractor Atmel can perform more frequent periodic qualifications or Reliability Monitors. This increased frequency is the best assurance of continued high quality and reliability in Atmel's product.



DIE FABRICATION PROCESS QUALIFICATION

Test Flow & Conditions

- Baseline Electrical Parameters Per Device Specification
 - Dynamic Lifetest : 100 Dev, Acc on 1 Failure.
1000 Hours @ 125C°
 - Data Retention Bake (NVM Only) - 100/0.
1000 Hours @ 150° C
 - Latchup (All Product) Per JEDEC 17 - 3/0
120 mA Trigger Current At 25C°
 - ESD Sensitivity Per MS883, M3015.
 - Human Body Model (15000Ω, 100pf).



QUALIFICATION DATA

Dynamic Life Test:

Condition: 125C° @ 5.5V or 6.5V

Device	Lot#	Req#/Yr	48 Hrs.	168 Hrs.	500Hrs.	1K Hrs.
Tiny26	1J2999	2252/02	0/150	0/135	0/135	0/135
90VC8544	2E4326	2267/02	0/300	0/99	0/99	0/99
Mega8	2E0532	2182/02	0/79	0/79	0/79	0/79
Mega128	1J3918	2173/02	0/27	0/27	0/27	0/27
Mega128	2E0973	2173/02	0/22	0/22	0/22	0/22
Mega128	2E0978	2173/02	0/29	0/29	0/29	0/29
Mega8515	2H7950	091/03	0/150	0/150	0/150	0/150
Mega8535	2J5296-1	157/03	0/100	0/100	0/100	0/100
Mega162	2J0038	163/03	0/150	0/150	0/150	0/150
Mega169	4E6992		0/100	0/100	0/100	0/100
Mega169	4G4904		0/100	0/100	0/100	0/100
90VC8544	2H0472	307/02	0/59	0/59	0/59	0/59

FITs Data

High Temperature Operating Life

Equiv. Fld. Hours	Test Hours	Sample Size	Failures
3,728	48	1,066	0
13,047	168	1,050	0
38,829	500	1,050	0
77,658	1,000	1,050	0

Failure Mechanism: Zero Failures

Activation Energy = 0.70 eV

Temperature (field) = 55 °C

Device-Hours (stress) = 1,050

Device-Hours (field) = 81,700,000

Confidence Level = 90 %

Junction Temp. (field) = 55.0 °C

Thermal Acceleration Factor = 78

Voltage Acceleration Factor = 1

OVERALL Acceleration Factor = 78

Alternate Acceleration Factor = 0 (leave 0 if not used)

Temperature (stress) = 125 °C

Chi-Square FIT Rate = 28

MTTF (hours) = 3.6E+07

Junction Temp. (stress) = 125.0 °C

**Data Retention Bake Test:****Condition: 150C°**

Device	Lot#	Req#/Yr	168 Hrs.	500Hrs.	1K Hrs.
Tiny26	1J2999	252/02	0/120	0/120	0/120
90VC8544	2E4326	267/02	0/50	0/50	0/50
Mega8	1J1697	176/02	0/100	0/100	0/100
Mega128	1J1166	124/02	0/88	0/88	0/88
Mega128	1J1170	124/02	0/50	0/50	0/50
Mega128	1J3918	173/02	0/248	0/248	0/248
Mega128	2E0973	173/02	0/249	0/249	0/249
Mega128	2E0978	173/02	0/250	0/250	0/250
Mega128	2E0976	211/02	0/20	0/20	0/20
Mega128	1J3384	212/02	0/20	0/20	0/20
Mega128	1J3954	210/02	0/20	0/20	0/20
Mega8515	2E0524	039/03	0/150	0/150	0/150
Mega162	2J0038	163/03	0/150	0/150	0/150
Mega162	3G0750	205/03	0/200	0/200	0/200
Mega169	4E6992	107/04	0/100	0/100	0/100
Mega169	4E6990A	151/04	0/100	0/100	0/100
Mega169	4G2904	156/04	0/100	0/100	0/100

HAST:**Condition: 130C°,85%RH, 2ATM**

Device	Lot#	Req#/Yr	100 Hrs.
Tiny26	1J2999	252/02	0/50
90VC8544	2E4326	267/02	0/50
Mega8	1J1697	176/02	0/99
Mega128	1J3918	173/02	0/50
Mega128	2E0978	173/02	0/50
Mega128	2E0973	173/02	0/50
Mega8515	2E0524	039/03	0/50
Mega8535	2J5296-1	157/03	0/54
Mega162	2J0038	163/03	0/50
Mega169	4E6992	107/04	0/42
Mega169	4E6990A	151/04	0/42
Mega169	4G2904	156/04	0/42
90VC8544	3G3946D	248/03	0/50

**Temperature Cycling Test:**

Condition: -65C°/+150C° for all packages except CASON
-55C°/+125C° for CASON

Device	Lot#	Req#/Yr	200 Cyc.	1k Cyc.
Tiny26	1J2999	252/02	0/50	0/50
90VC8544	2E4326	267/02	0/50	0/50
Mega8	1J1697	176/02	0/44	0/44
Mega128	2E0973	173/02	0/50	0/50
Mega128	2E0978	173/02	0/50	0/50
Mega128	1J3918	173/02	0/50	0/50
Mega128	2E0976	211/02	0/55	0/55
Mega128	1J3384	212/02	0/50	0/50
Mega8515	2E0524	039/03	0/50	0/50
Mega8535	2J5296-1	157/03	0/50	0/50
Mega162	2J0038	163/03	0/50	0/50
Mega169	4E6992	107/04	0/77	0/77
Mega169	4E6990A	151/04	0/77	0/77
Mega169	4G2904	156/04	0/77	0/77
90VC8544	3G3946D	248/03	0/50	0/50

Pressure Pot Test:

Condition: 121C°,100%RH,2ATM

Device	Lot#	Req#/Yr	168 Hrs	240 Hrs.
Tiny26	1J2999	252/02	0/50	0/50
90VC8544	2E4326	267/02	0/50	0/50
Mega8	1J1697	176/02	0/50	0/50
Mega128	1J1166	124/02	0/49	0/49
Mega128	1J1160	124/02	0/49	0/49
Mega128	2E0973	173/02	0/50	0/50
Mega128	2E0978	173/02	0/50	0/50
Mega128	1J3918	173/02	0/50	0/50
Mega128	2E0976	211/02	0/28	0/28
Mega128	1J3384	212/02	0/26	0/26
Mega128	1J3959	210/02	0/25	0/25
Mega8515	2E0524	039/03	0/50	0/50
Mega8535	2J5296-1	157/03	0/50	0/50
Mega162	2J0038	163/03	0/50	0/50
Mega169	4E6992	107/04	0/75	0/75
Mega169	4E6990A	151/04	0/77	0/77
Mega169	4G2904	156/04	0/77	0/77
90VC8544	3G3946D	248/03	0/50	0/50



ATMEL CORPORATION

ELECTROSTATIC DISCHARGE SENSITIVITY CLASSIFICATION MIL-STD-883 METHOD 3015.7 (HBM)

DEV. TYPE: AT90VC8544 (35566) LOT# 1C0971 DATE CODE:
ATMEGA169 (35579) : 3H6992 0420

SEQ NO	TEST	TEST METHOD	METHODS & CONDITIONS PER MIL-STD-883	QTY IN	QTY OUT	RE-JECTS	DATE	
1	ELECT TEST	5005	Group A, Subgroup 1 TA = 25°C	12 12	12 12	0 0	5-29-02 6-7-04	
2	ESDS	3015.7	Apply 3 positive and 3 negative pulses of 500 Volts to each of these specified pin combinations: S/N 1-3	3 3	3 3	0 0	5-31-02 6-7-04	
3	ESDS	3015.7	Apply 3 positive and 3 negative pulses of 1,000 Volts to each of these specified pin combinations: S/N 4-6	3 3	3 3	0 0	5-31-02 6-7-04	
4	ESDS	3015.7	Apply 3 positive and 3 negative pulses of 2,000 Volts to each of these specified pin combinations: S/N 7-9	3 3	3 3	0 0	5-31-02 6-7-04	
5	ESDS	3015.7	Apply 3 positive and 3 negative pulses of 4,000 Volts to each of these specified pin combinations: S/N 10-12	3 3	3 3	0 0	5-31-02 6-7-04	
6	ELECT TEST	5005	Group A, Subgroup 1 & 7 TA = 25°C	12 12	12 12	0 0	6-2-02 6-16-04	

DATE: 7-18-02
6-16-04



Date: 7-18-02

Latchup Trigger Current at Vcc=5.5V (trigger compliance at 7.5V)

Device Name: AT90VC8544

Lot #: 2E4326

Die #: 35566

Pack/Assm'ly: TQFP

D/C:

Done at ATMEL, San Jose, CA (JEDEC Std 78 Latch-Up)

Pin	Function	Negative	Positive
1	ADIN0	-400mA	200mA
2	N/C		
3	N/C		
4	N/C		
5	N/C		
6	N/C		
7	N/C		
8	N/C		
9	N/C		
10	N/C		
11	AGND		
12	N/C		
13	ADIN1	-400mA	200mA
14	ADIN2	-400mA	200mA
15	ADIN3	-400mA	200mA
16	ADIN4	-400mA	200mA
17	ADIN5	-400mA	200mA
18	AVCC		
19	N/C		
20	RESET	-400mA	200mA
21	N/C		
22	VCC		
23	XTAL2	-400mA	200mA
24	XTAL1	-400mA	200mA
25	N/C		
26	N/C		
27	N/C		
28	N/C		
29	N/C		
30	N/C		
31	GND		
32	N/C		
33	PA6	-400mA	
34	INT1	-400mA	
35	INT0	-400mA	200mA
36	N/C		
37	N/C		
38	PA5	-400mA	
39	PA4	-400mA	
40	N/C		
41	N/C		
42	N/C		
43	N/C		
44	PA3	-400mA	
45	PA2	-400mA	
46	PA1	-400mA	
47	PA0	-400mA	
48	N/C		



Date: 6-8-04

Latchup Trigger Current at Vcc=5.5V (trigger compliance at 7.5V)

Device Name: MEGA169

Lot #: 4E6992

Die #: 35579

Pack/Assm'ly: TQFP

D/C: 0420

Done at ATMEL, San Jose, CA (JEDEC Std 78 Latch-Up)

Pin	Function	Negative	Positive
1	LDCAP	-600mA	600mA
2	PE0	-600Ma	600Ma
3	PE1	-600mA	600mA
4	PE2	-600mA	600mA
5	PE3	-600mA	600mA
6	PE4	-600mA	600mA
7	PE5	-600mA	600mA
8	PE6	-600mA	600mA
9	PE7	-600mA	600mA
10	PB0	-600mA	600mA
11	PB1	-600mA	600mA
12	PB2	-600mA	600mA
13	PB3	-600mA	600mA
14	PB4	-600mA	600mA
15	PB5	-600mA	600mA
16	PB6	-600mA	600mA
17	PB7	-600mA	600mA
18	PG3	-600mA	600mA
19	PG4	-600mA	600mA
23	XTAL2	-600mA	600mA
24	XTAL1	-600mA	600mA
25	PD0	-600mA	600mA
26	PD1	-600mA	600mA
27	PD2	-600mA	600mA
28	PD3	-600mA	600mA
29	PD4	-600mA	600mA
30	PD5	-600mA	600mA
31	PD6	-600mA	600mA
32	PD7	-600mA	600mA
33	PG0	-600mA	600mA
34	PG1	-600mA	600mA
35	PC0	-600mA	600mA
36	PC1	-600mA	600mA
37	PC2	-600mA	600mA
38	PC3	-600mA	600mA
39	PC4	-600mA	600mA
40	PC5	-600mA	600mA
41	PC6	-600mA	600mA
42	PC7	-600mA	600mA
43	PG2	-600mA	600mA
44	PA7	-600mA	600mA
45	PA6	-600mA	600mA
46	PA5	-600mA	600mA
47	PA4	-600mA	600mA
48	PA3	-600mA	600mA
49	PA2	-600mA	600mA
50	PA1	-600mA	600mA
51	PA0	-600mA	600mA
54	PF7	-600mA	600mA
55	PF6	-600mA	600mA
56	PF5	-600mA	600mA
57	PF4	-600mA	600mA
58	PF3	-600mA	600mA
59	PF2	-600mA	600mA



60	PF1	-600mA	600mA
61	PF0	-600mA	600mA



TECHNOLOGY GENERAL 35.5K

1. DIE THICKNESS	20 Mil PDIP, 11 Mil/20 Mil SOIC, 11 Mils TQFP, 11Mils MLF, and 9Mil CASON
2. PASSIVATION	10 KA OXINITRIDE 11 KA TEOS OXIDE
3. TECHNOLOGY NAME	35.5K
4. CELL SIZE	1.26u x 3.57u
5. METAL PITCH	0.91u for M-1 1.05u for M-2 & M3
6. N-CH Gate Length	0.49u
7. P-CH Gate Length	0.49u
8. METAL LAYERS	3 (Al/Cu 99.5/0.5%)
9. POLY LAYERS	2
10. TECHNOLOGY	CMOS
11. MIN. FEATURE	0.35u x 0.35u (Contact)



PACKAGE ASSEMBLY PROCESS QUALIFICATION

Plastic - Test Flow & Conditions - Environmental

Baseline Electrical Parameters Per Device Specification

- **Operating Life Test**
 - Ta: 125C°
 - Vcc: 6.5V, 3.7V (Low voltage products) or per specification
 - Data: CKBD
 - Preconditioning: No
 - Test Intervals: 48, 168,500 and 1K hrs.
- **Data Retention Bake (NVM Only)**
 - Ta: 150C°
 - Data Pattern: a) 99% 00's
b) CKBD
 - Test Intervals: 168, 500,1000 hrs.
- **Autoclave**
 - Condition: 121C°, 100% RH, 2ATM
 - Data Pattern: a) 99% 00's
b) CKBD
 - Test Intervals: 168 hrs.
- **Temperature Cycle**
 - Conditions: -65C°/+150C° or -55C°/+125C° for CASON
 - Data Pattern: CKBD
 - Preconditioning: Yes
 - Test Intervals: 200 and 1000 cycles
- **Temptrature and Humidity Test**
 - Conditions: Ta: 85C°, 85%RH
 - Vcc: 5.5V, 3.7V(Low voltage products) or per specification
 - Mode: Static
 - Data Pattern: CKBD
 - Preconditioning: Yes
 - Test Intervals: 168, 500 and 1K hrs.
- **HAST**
 - Conditions: Ta: 130C°, 85% RH
 - Vcc: 5.5V, 3.7V (Low Voltage Products) or per specification
 - Mode: Static Standby
 - Data Pattern: CKBD
 - Preconditioning: Yes
 - Test Intervals: 100 hrs.



MICROCONTROLLARS ASSEMBLY MATERIALS

1. ASSEMBLY HOUSES: Chippac, Asat, Amkor, Aic, Chantek.

2. LEAD FRAME
CU(OLIN 194), 0.008";
CDA-151 ¾ HARD;
CU7025 EFTEC 64T;
ALLOY 42, A151
MATT Tin (Pb-free)

3. LEAD PLATING COMPOSITION
Sn/Pb = 85/15 (std)
Sn=100 (Pb-free)

4. DIE ATTACH VENDOR AND NUMBER
ABLE BOND 84 - 1LMISR4
ABLE BOND 8360
ABLEBOND 8361J
CRM1079B
ABLEBOND 84-1LM1SR7 AND LM1SR6
ABLESTICK 84-1LM1SR4
ABLESTICK 8920 (Pb-free)

5. BOND WIRE MATERIAL AND
DIAMETER
Au 99.99% 1.0, 1.2 OR 1.3 MIL

6. MOLDING COMPOUND
SUMITOMO 63000H
SUMITOMO EME 6600CS
EME 7351LS
EME 7320CR
SUMITOMO G-700 (Pb-free)