

The Reliability Data Program

Expanded Version



TABLE OF CONTENTS

<u>Introduction</u>	4
<u>The Reliability Program</u>	4
<u>New Process/Design Qualification</u>	4
<u>Initial Qualification</u>	5
<u>Process Changes</u>	5
<u>New Package Qualifications</u>	5
<u>Non-Hermetic Packages</u>	5, 6
<u>Hermetic Packages</u>	6
<u>Reliability Monitor</u>	6
<u>Process Monitor</u>	7
<u>Assembly Package Monitor</u>	7
<u>Reliability Families</u>	7
<u>Failure Analysis</u>	7
<u>Table I</u>	8, 9
<u>Table II</u>	10
<u>Failure Acceleration Rates</u>	11
<u>Table III</u>	12

TABLE OF CONTENTS
Continued

<u>Plastic Encapsulant Data</u>	13
<u>Typical IR-Reflow Profile</u>	14
<u>Product Moisture Classification</u>	15
<u>Latch-Up Data</u>	16 - 17
<u>ESD Data</u>	18 - 19
<u>The FPGA Products</u>	20 - 84
<u>The CPLD and EPROM Products</u>	85 - 125
<u>The Hardwire Products</u>	126 - 143
<u>Package Qualification & Monitor</u>	144 - 166
<u>Plastic Package Qualification Test Data</u>	145 - 157
<u>Ceramic Package Qualification Test Data</u>	158 - 166
<u>Solderability Test Qualification per EIAJ</u>	167 - 171
<u>Low Temperature Soldering Test</u>	172 - 173

1. This reliability report is published by Xilinx to provide insight to our customers concerning the reliability of Xilinx products. Reliability is defined as product performance to specification over time in response to varied (specified) environmental stress. The science of reliability engineering is devoted to improving this product performance through measurement, failure analysis, feedback, and corrective action. The ultimate goal of any reliability program is to achieve continuous improvement in the robustness of the product being evaluated.

As part of this program, finished product reliability is measured periodically to ensure that the product performance meets or exceeds internal and external reliability specifications. Reliability programs are executed in response to internal programs as well as to individual customer requirements. All testing is performed or supervised by experienced Xilinx employees using facilities which are approved and audited by Xilinx for compliance to the requirements of DSCC-VAC and MIL-STD-883 requirements.

2. **The Reliability Program:** The Xilinx reliability qualification of new devices, wafer processes, and packages is designed to ensure that these devices and/or processes satisfy the internal and external customer requirements before transfer into production. The reliability requirements for this transfer are spelled out below.

2.1 **New Process/Design Qualification:** For new process qualification, the qualifications are to run and pass two wafer lots of high temperature life test. This test accelerates failure mechanisms which are thermally excited by high temperature, such as ionic drift, oxide breakdown, silicon material defects, and assembly related mechanisms. Two lots are run, one to 1,000-hours at 145 degrees C and 5.7 V. or 3.3 V. bias. The second lot is run to 256-hours at 145 degrees C and 5.7V or 3.3 V bias. The sample size is based on a LTPD = 3.

In addition to the temperature life test, two wafer lots must be run and pass the Bias Moisture life. This evaluates the effectiveness of chip passivation and device packaging. High humidities in the presence of electrical bias promote electro-chemical corrosion, electro-thermal migration, and other chemical reactions involving the presence of water. The required bias moisture life time at Xilinx is 1,000-hours minimum at 85 degrees C temperature, 85% relative humidity and 5.0V or 3.3 V. bias. The sample size is based on a LTPD = 3.

One wafer lot must be run and pass the Temperature cycle test. This evaluates the resistance of the die, package combination. The required number of cycles is 500 cycles at -65 degrees C/+150 degrees C. The sample size is based on a LTPD = 3

2.2 Initial Qualification: For a new die type from a previously qualified process, the requirements are to run one wafer lot of high temperature life test (asa monitor). Lot will be run to 256-hours at 145 degrees C and 5.7 V. or 3.3V. bias; the sample size is based on a LTPD = 3.

2.3 Process Changes: For major process changes (major changes are identified as outlined per MIL-PRF-38535 Appendix A and MIL-STD-883) that occur to a qualified device, the above requirements (Refer to Section 2.2) are to be again fulfilled.

2.4 New Package Qualification:

2.4.1 Non-Hermetic Packages: The non-hermetic package qualification requires one lot to be run for each of the following tests:

Unbiased Pressure Pot - Pressure pot test is performed to identify the effects of high humidity and heat conditions on the die surface. Steam stressing accelerates moisture penetration through the plastic package material to the surface of the die, resulting in corrosion of metal. The required pressure pot test time is 96-hours at a temperature of 121 degrees C and a pressure of to 2 atmosphere. The sample size is based on a LTPD = 3 .

Temperature Cycling (Liquid to Liquid) - Temperature Cycling applies thermally-induced stress to the devices to accelerate material fatigue and to precipitate failures associated with thermal expansion mismatch and microcracks. The required total cycles are 500 cycles done per method 1011, Condition C (-65 C/ +150 C) of MIL-STD-883 (no bias). The minimum sample size is based on a LTPD = 3. (This test is optional)

Temperature Cycling (Air to Air) - Temperature Cycling applies thermally-induced stress to the devices to accelerate material fatigue and to precipitate failures associated with thermal expansion mismatch and microcracks for a longer period of test. The required total cycles is 500 cycles done per method 1010, Condition C (-65 C/+150 C) of MIL-STD-883. The minimum sample size is based on a LTPD = 3.

Resistance to Solvents - This test evaluates the integrity of the package marking. At the present time this test is done outside the company at a qualified test laboratory. Test done per method 2015 of MIL-STD-883. The minimum sample size is 3 units and the allowable maximum reject units is 0.

Solderability - This test is performed to evaluate the integrity of the leads. At the present time this test is done outside the company per a qualified test laboratory. Test done per method 2003 of MIL-STD-883. The minimum sample size is 3 units (25 leads) and the allowable maximum reject units is 0.

Lead Fatigue - This test is performed to evaluate the integrity of the leads. At the present time test is done outside the company at a qualified test laboratory. Test done per method 2004 of MIL-STD-883. The minimum sample size is 3 units (25 leads) and the allowable maximum reject units is 0.

2.4.2 Hermetic Packages: The hermetic package qualification requires a full group D test per MIL-STD-883, Method 5005.

2.5 **Reliability Monitor:** In addition to qualifying all new products and processes before going into production, Xilinx also runs periodic reliability monitors on existing production processes. The details of this monitor program are spelled out in Table I.

2.5.1 Process Monitor: Xilinx fabrication processes are grouped into 15 families according to similarities in process and reliability characteristics and by fabrication facility. One or more products within these fabrication process families are selected as monitor vehicles. Process Monitor is run once a month with rotation of all 15 product families. Lot is tested with static burn-in (Refer to Table I for conditions and time).

2.5.2 Assembly Package Monitor: Package types are grouped into families according to the package characteristics and assembly location. Two major categories, Plastic and Ceramic packages, are identified and each Package Family encompasses one or more lead counts.

Assembly Plastic Package Families are monitored once per quarter using a standard set of reliability tests listed in Table I. Monitor is run on separate packages from the Plastic Package families with rotation of all packages in the families.

- 3. Reliability Families:** Xilinx products are manufactured in several worldwide locations. A limited number of process technologies are used for all product lines, resulting in manufacturing efficiency and significant experience with a particular process in different device applications. This strategy accelerates Xilinx's progress on the learning curve and results in process and products which are thoroughly characterized, inherently more reliable, and of the highest quality.

There are 15 different product families at Xilinx with various package combination: EPROM XC1700D, XC1700/L/E, XC17SXX, XC7000 (EPLD), Flash XC9500, and LCA (Logic Cell Array); XC3000/A, XC3100/A, XC4000/E, XC4000EX, XC4000XL, XC4000XLA, XC4300, XCSXX, XC4000XV, XC5000. Each product family has one or more products. These products are listed in Table II.

- 4. Failure Analysis:** At Xilinx analysis is performed on all Qualification stress test failures, with the appropriate failure mechanism identified. For Failure analysis Xilinx uses the Failure Analysis Lab. in house Failure Analysis Lab. and outside subcontractors that are in constant contact with Design and product Engineering personnel. Each failure analysis is analyzed and categorized in accordance with the failure mechanism.

TABLE I

STRESS	PURPOSE OF TEST	TYPICAL TEST PARAMETERS	SAMPLE FREQUENCY/ STRESS FAMILY
High Temperature Operating Life (HTOL)	Determine major changes in device process, infant mortality levels	145 C Vcc = 5.7V or 3.3V for 256-hours, continuous bias applied. SS = 45 + 2 spares Accept 0	Monthly/Fab Process Family Assembly Package Family
Extended Static Life Test	Determine device process durability to electrical and thermal stresses for long period of time	145 C Vcc = 5.7V or 3.3V for 2,000-hours, continuous basis applied. SS = 45 + 2 spares Accept = 0	Quarterly/Fab Process Family
Temperature Humidity (85/85)	Evaluate moisture resistance of die in plastic package	85 C @ 85% R.H. Vcc = 5.0V or 3.3V for 1,000-hrs, continuous bias applied. SS = LTPD 3	Quarterly/Fab Process Family Assembly Package Family
Moisture Test	Test moisture resistance and integrity of plastic package	121 C @ 2 Atm. for 96-hours. SS = 45 Accept = 0	Quarterly/Assembly Package Family
Thermal Shock (optional)	Evaluate resistance of the package to cracking and resistance of the bonding wires and leadframe separation	Cond. C, Method 1011 of MIL-STD-883, -65 C to +150 C for 500 Cycles Liquid to Liquid. SS = 45 Accept = 0	Quarterly/Fab Process Family Assembly Package Family
Temperature Cycling	Detect mechanical reliability problems and thin film leakage caused by temperature change	Cond. C Method 1010 of MIL-STD-883, -65 C +150 C for 500 Cycles Air to Air. SS = 45 Accept = 0	Quarterly/Fab Process Family Assembly Package Family

**TABLE I
Continued**

STRESS	PURPOSE OF TEST	TYPICAL TEST PARAMETERS	SAMPLE FREQUENCY/ STRESS FAMILY
Salt Atmosphere (Hermetics only)	Evaluate resistance to corrosion of the package finish and marking	Cond. A, Method MIL-STD-883, Method 1009, 24-hours. SS = 15 Accept = 0	Quarterly/Fab Process Family Assembly Package Family
Solderability	Evaluate the solderability of the leads under conditions of low soldering temperature following exposure to the aging effects of water vapor	MIL-STD-883, Method 2003. SS = 3 (25 Leads) Accept = 0	Quarterly/Fab Process Family Assembly Package Family
Mark Permanency	Evaluate the integrity of the package marking during exposure to a variety of solvents	MIL-STD-883, Method 2015. SS = 3 Accept = 0	Quarterly/Fab Process Family Assembly Package Family
Lead Fatigue	Evaluate the resistance of the completed assembly to vibrations during storage, shipping, and operations	MIL-STD-883, Method 2004. SS = 3 (25 Leads) Accept = 0	Quarterly/Fab Process Family Assembly Package Family
Physical Dimension	Verify that the external physical dimensions of the device are in accordance with the applicable procurement document	MIL-STD-883, Method 2015. SS = 15	Quarterly/Fab Process Family Assembly Package Family

TABLE II

EPROM XC1700D XC1700/L/E	EPROM XC17SXX	LCA XC3000/A	LCA XC3100/A	LCA XC4000/E	LCA XC4000/EX	LCA XCSXX
XC1718D XC1736D XC1765D XC17128D XC17256D XC1701 XC1765E XC17256E	XC17S05 XC17S10 XC17S20 XC17S30 XC17S40	XC3020/A XC3030/A XC3042/A XC3064/A XC3090/A	XC3120/A XC3130/A XC3142/A XC3164/A XC3190/A XC3195/A	XC4003/E XC4005/E XC4006/E XC4008/E XC4010/E XC4013/E XC4020/E XC4025/E	XC4028EX XC4036EX LCA XC4000XV XC40110XV XC40150XV XC40250XV	XCS05 XCS10 XCS20 XCS30 XCS40

LCA XC4000XL	LCA XC4000XLA	LCA XC4300 (Hardwire)	LCA XC5000	EPLD XC7000	FLASH XC9500
XC4005XL XC4010XL XC4013XL XC4020XL XC4028XL XC4036XL XC4044XL XC4052XL XC4062XL XC4085XL	XC4013XLA XC4020XLA XC4044XLA XC4028XLA XC4036XLA XC4062XLA XC4085XLA	XC4303 XC4305 XC4310	XC5202 XC5204 XC5206 XC5210 XC5215	XC7272/A XC7236 XC73108 XC73144 XC7336 XC7354 XC7372	XC9536 XC9572 XC95108 XC95216 XC95288



5. **Failure Acceleration Rates:** Since Xilinx uses accelerated stress tests in determining product failure rates, it is important to understand how the accelerated conditions are translated to standard operating conditions. Xilinx uses temperature acceleration techniques in which the thermal activation energy (Ea) is assigned for all failures mechanisms. FIT rates can be calculated from these data using the procedure for FIT rate calculation outlined below. The result will be the upper control limit expressed in Fits for the desired degree of confidence.

$$\text{Upper control limit expressed in Fits} = \frac{\chi^2}{2(\text{No. of dev.})(\text{No. of hrs.}) (\text{acc. Factor})}$$

Where χ^2 = tabular value of chi-squared distributions at the confidence level desired at $(2f + 2)$ degrees of freedom, where f is the number of failures.

The acceleration factor is calculated using the Arrhenius relationship

$$A = \exp \left\{ \frac{E_a}{k} \left(\frac{1}{T_{j2}} - \frac{1}{T_{j1}} \right) \right\}$$

Ea = Thermal activation energy (electron Volts)

A = Acceleration factor (0.9 Ev expressed in electron volts)

K = Boltzman's constant $\{8.617164 \times 10^{-5} \text{ ev/deg K}\}$

Tj1 = In-use junction temperature in degrees Kelvin ($T_{in} \text{ } ^\circ\text{K} = T \text{ in } ^\circ\text{C} + 273.16$)

Tj2 = In stress junction temperature in degrees Kelvin ($T_{in} \text{ } ^\circ\text{K} = T \text{ in } ^\circ\text{C} + 273.16$)

The in-use failure rate is the computed by dividing the in-stress failure rate by the acceleration factor

$$fr1 = fr2/A$$

fr1 = Failure rate at specified in-use junction temperature Tj1

fr2 = Failure rate at specified in-stress junction temperature Tj2

A = Acceleration factor

Notes:

FIT = Failure Unit

1 FIT = 1 Failure / Billion device hours (1×10^9 failures)

1 FIT = 1 Failure / 10^9 Device hours



TABLE III

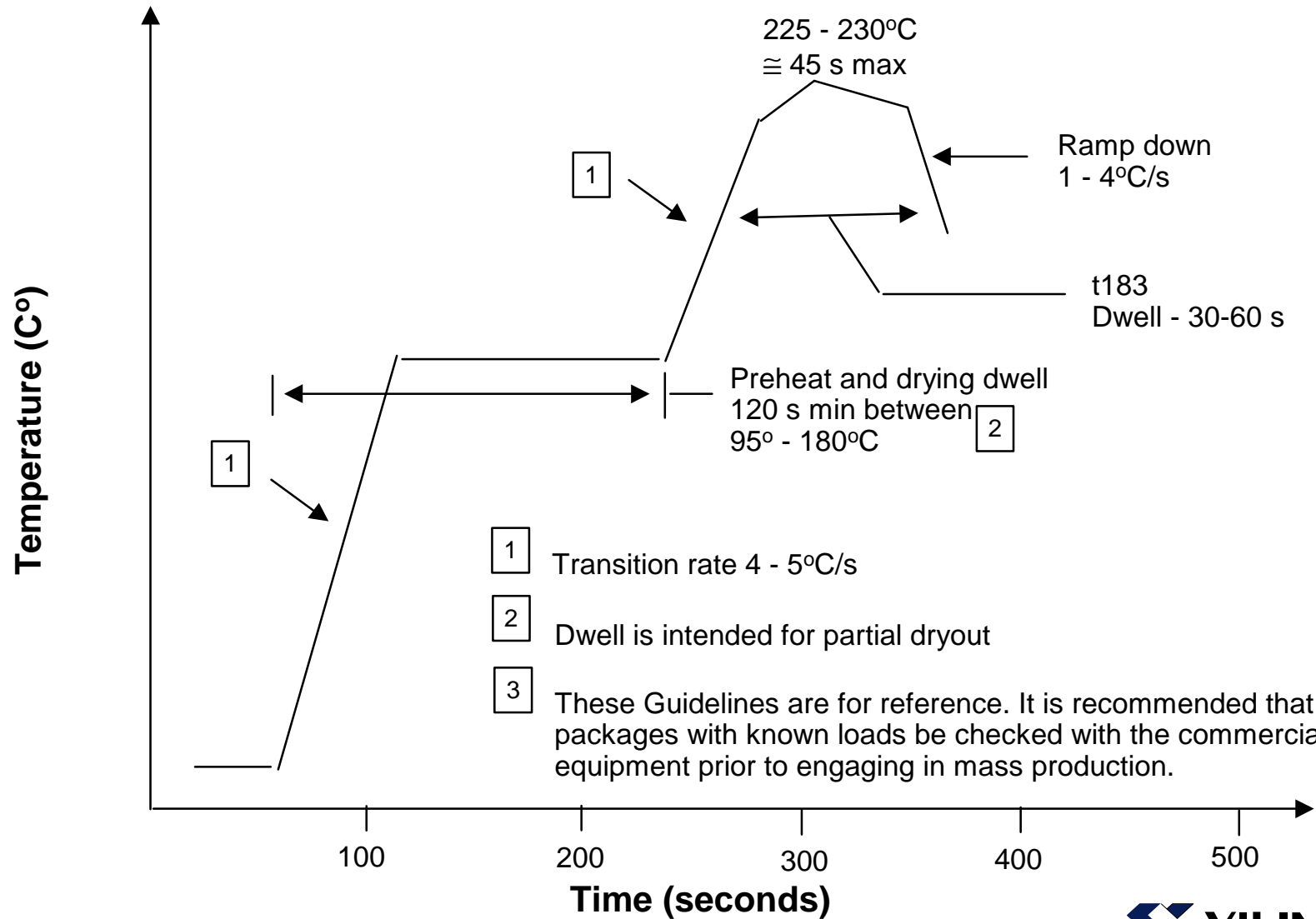
F/A ACRONYM	DESCRIPTION	F/A ACRONYM	DESCRIPTION
ASL	Lifted Ball Bond	CMGL	Fine Leak at seal glass between Ceramic material glass.
FANC	Failure Analysis not completed	INC	Inconclusive
MST	Moisture in package	VCMD	Via contact to metal defect
RAND	Random defect	VUO	Via opened

Plastic Encapsulant Data (Typical)

	Test Conditions	6300HS	7320C	7304	MP8000CH4
Volume Resistivity (Ohm.cm)	150C	1×10^{13}	1×10^{13}	1×10^{13}	5.5×10^{13}
Water Absorption)	Boil 48 hrs (wt%)	0.3/24 hrs	0.22/24 hrs	0.25/24 hrs	0.3/48 hrs
Spiral Flow	(cm)	80	180	125	90cm
Ionic Impurities 160C x 23 hrs Extraction	Na+ (ppm)	<1	<1	<1	2
	Cl - (ppm)	5	5	5	18
Flexural Strength (kgf/mm) ²	25C	12	17	17	17
Flexural Modulus (kgf/mm) ²	25C	1200	1750	1800	1900
Thermal Expansion (Cured @ 175C for 5 hrs)	α 1(1/C)	1.7×10^{-5}	1.3×10^{-5}	1.4×10^{-5}	1.2×10^{-5}
	α 2(1/C)	6.8×10^{-5}	5.2×10^{-5}	5.8×10^{-5}	4.9×10^{-5}
Glass Transition -	Tg Range (C)	155 ~ 170C	130 ~ 155C	153 ~ 165C	156C ~ 160C



XILINX Typical I.R. Reflow



Product Moisture Classification

Package (Lead Count)	Products	Moisture Level / Floor life (1)
PD-8	XC1700D/E & XC17SXX	Level 1 / Unlimited
SO-8	XC1700D/E & XC17SXX	Level 1 / Unlimited
VO-8	XC1700D/E & XC17SXX	Level 1 / Unlimited
PLCC (20, 44, 68)	ALL	Level 1 / Unlimited
PLCC 84	ALL	30% Level 1 / Unlimited 70% Level 3 / 168 hours
PQFP (100, 160, 208, 240)	ALL	Level 3 / 168 hours
TQFP (44, 100, 144, 176)	ALL	Level 3 / 168 hours
HQFP (160, 208, 240, 304)	ALL	Level 3 / 168 hours
VQFP (44, 100)	ALL	Level 3 / 168 hours
HTQFP (144, 176, 208)	ALL	Level 3 / 168 hours
PPGA (132, 175)	ALL	Level 1 / Unlimited
MQFP (208, 240)	ALL	Level 1 / Unlimited
BGA (225, 256)	ALL	Level 3 / 168 hours
SBGA (352, 432, 560)	ALL	Level 3 / 168 hours
SBGA (560)	XC4085XL	Level 3 / 168 hours

Note (1): Classification for Plastic Integrated Circuit Surface Mount Devices, per J-STD-020



Latch-Up Data Per EIA/JEDEC-78

<u>Device</u>	<u>Worst Latch-Up</u>		<u>Latch-Up Test Condition</u>
XC17XXD/L	300mA Vcc +4.1V <-300mA Gnd -1.7V	>560mA Vcc +3.9V <-560mA Gnd -2.5V	25°C
XC17XXE XCS17XX	>300mA Vcc +4.1V <-300mA Gnd -1.7V	to >600mA Vcc +9.0V <-600mA Gnd -2.5V	25°C
XC3XXX/A	220mA Vcc +1.8V <-300mA Gnd -1.8V	to 300mA Vcc +2.4V <-300mA Gnd -1.4V	25°C
XC31XX/A	300mA Vcc +1.5V <-300mA Gnd -1.3V		25°C
XC4XXX/A	300mA Vcc +2.6V <-300mA Gnd -1.4V		25°C
XC4XXXE	250mA Vcc +1.5V <-250mA Gnd -1.7V	to 300mA Vcc +2.5V <-300mA Gnd -1.5V	25°C
XC4XXXL	Vcc +3.4V** <-250mA Gnd -1.4V	Vcc +3.4V** <-550mA Gnd -1.55V	25°C

** The new 5V tolerant I/O's used in the XL device are guaranteed not to sustain permanent damage when input is forced to maximum of 7V and with the forcing power supply being current limited to 200 mA.

Latch-Up Data

Per EIA/JEDEC-78

<u>Device</u>	<u>Worst Latch-Up</u>		<u>Latch-Up Test Condition</u>
XC4XXEX	250mA Vcc +1.8V <-250mA Gnd -1.6V	to 400mA Vcc + 7.0V <-400mA Gnd -1.33V	25°C
XC4XXXLA	300mA Vcc +5.6V <-300mA Gnd -1.5V		25°C
XC4300	>200mA Vcc +1.0V <200mA Gnd -1.75V		25°C
XCSXX	>410mA Vcc +8.1V <410mA Gnd -2.0V		25°C
XC5200	250mA Vcc +2.40V <-250mA Gnd -1.40V	to 350mA Vcc +2.35V <-400mA Gnd -2.20V	25°C
XC7XX/A	150mA Vcc +2V <-150mA Gnd -5.25V	to 200mA Vcc +5.25V <-200mA Gnd -5.25V	125°C
XC7XXX	200mA Vcc +2.0V <-200mA Gnd - 2.0V	to 300mA Vcc +2.0V <-300mA Gnd - 2.0V	25°C
XC95XX	250mA Vcc +1.3 <-250mA Gnd -2.0V	to 600mA Vcc +7.2V <-600mA Gnd -1.70V	25°C
XC6000	>210mA Vcc +1.5V <-210mA Gnd -1.4V		25°C



ESD Data

<u>Device</u>	Human Body Model	Machine Model	Charge Device Model
	Worst Case ESD	Worst Case ESD	Worst Case ESD
	Mil-Std-883D <u>Method 3015</u>	EIAJ <u>Method 20</u>	
XC17XXXD	±6000V	+500V to +900V	±2000V (1)
XC17XXE XCS17XX	±3000V to ±6000V	+325V	±1000V (1)
XC3XXX/A	±4000V to ±7000V	+325V to +600V	±2000V (2)
XC31XX/A	±1750V to ±8000V	+800V to +700V	±1000V (3)
XC4XXX/A	±1000V to ±8000V	+800V to +900V	±2000V (4)
XC4XXXE	±3000V to ±8000V		±2000V (5)
XC4XXXEX	±3000V to ±7000V		±2000V (6)
XC4XXXXL	±2000V to ±6000V		±1000V (7)

(1) Measured on XC1765D, (2) Measured on XC3090, (3) Measured on XC3190/A, (4) Measured on XC4005
 (5) Measured on XC4005E, (6) Measured on XC4010E, (7) Measured on XC4028XL (±1000V, Equipment
 limitation), (12) Measured on XC17256E



ESD Data

<u>Device</u>	Human Body Model Worst Case ESD Mil-Std-883D <u>Method 3015</u>	Machine Model Worst Case ESD EIAJ <u>Method 20</u>	Charge Device Model Worst Case ESD
XC4XXXLA	±2000V to ±7000V		±500V (12)
XCSXX	±6000V		±1000V (11)
XC5XXX	±3000V to ±6000V		±2000V (8)
XC7XXX	±2000V to ±4000V		±2000V (9)
XC95XX	±2000V to ±8000V		±2000V (10)
XC4300	±2000V to ±3500V		

(8) Measured on XC5210, (9) Measured on XC7336, (10) Measured on XC95108, (11) Measured on XCS10 & XCS30, (12) Measured on XC4062XLA



The FPGA Products



Reliability Testing Summary

High Temperature Life Test Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC3000/A, XC3100/A, XC4000, XC4000E
Package Type: Various
Actual Temperature: 145C +8C/-0C
Actual Voltage: 5.7V +/-0.25
Assumed Activation Energy: 0.70 ev @ C.L. = 60%

	XC3000/A	XC3100/A	XC4000	XC4000E
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Period: July 1, 1996 to July 1, 1998

Combined Lots:	11	7	5	36
Failures:	0	0	0	1
Device on test:	669	317	227	1,895
Actual device hours:	588,750	347,725	192,167	2,018,367
Mean :	880	1,097	847	1,065
Equivalent device hours @ Tj=125C:	1,562,163	922,638	509,887	5,355,443
Equivalent device hours @ Tj=70C:	41,103,393	24,276,310	13,416,078	140,911,646
Equivalent device hours @ Tj=25C:	1.46E+09	8.65E+08	4.78E+08	5.02E+09
Failure Rate(60% C.L.) in FITS @ Tj=70C:	2.24	3.79	6.85	1.44
Failure Rate(60% C.L.) in FITS @ Tj=55C:	0.76	1.28	2.32	0.49
Failure Rate(60% C.L.) in FITS @ Tj=25C:	0.06	0.11	0.19	0.04



Reliability Testing Summary

High Temperature Life Test Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4000EX, XC4000XL, XCSXX,
Package Type: Various
Actual Temperature: 145C +8C/-0C
Actual Voltage: 3.6V +/-0.3**, 5.7V +/-0.25
Assumed Activation Energy: 0.70 ev @ C.L. = 60%

XC4000EX

XC4000XL
**

XC4000XL
Dynamic**

XCSXX

Period:

Jan. 1, 1997 to Jan. 1, 1999

	XC4000EX	XC4000XL	XC4000XL	XCSXX
Combined Lots:	1	23	1	4
Failures:	0	7	0	1
Device on test:	45	1,023	43	233
Actual device hours:	21,420	1,421,466	152,908	353,408
Mean :	476	1,390	3,556	1,517
Equivalent device hours @ Tj=125C:	56,835	3,771,653	405,719	937,717
Equivalent device hours @ Tj=70C:	1,495,430	99,239,194	10,675,223	24,673,066
Equivalent device hours @ Tj=25C:	5.33E+07	3.53E+09	3.80E+08	8.79E+08
Failure Rate(60% C.L.) in FITS @ Tj=70C:	61.44	59.34	8.61	8.22
Failure Rate(60% C.L.) in FITS @ Tj=55C:	20.84	20.12	2.92	1.90
Failure Rate(60% C.L.) in FITS @ Tj=25C:	1.73	1.67	0.24	0.23



Reliability Testing Summary

High Temperature Life Test Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XCSXXXL, XC4000XV, XC4000XLA, XC5000
Package Type: Various
Actual Temperature: 145C +8C/-0C
Actual Voltage: 2.7V +/-0.3(Core);3.6V+/-0.3(I/O)*,3.6V+/-0.3**, 5.7V +/-0.25
Assumed Activation Energy: 0.70 ev @ C.L. = 60%

XCSXXXL
**

XC4000XV
*

XC4000XLA
**

XC5000

Period: Jan. 1, 1997 to Jan. 1, 1999

	1	3	4	9
Combined Lots:	1	3	4	9
Failures:	0	0	1	0
Device on test:	72	110	187	519
Actual device hours:	19,008	101,054	173,501	852,849
Mean :	264	919	928	1,643
Equivalent device hours @ Tj=125C:	50,435	268,132	460,360	2,262,911
Equivalent device hours @ Tj=70C:	1,327,037	7,055,053	12,112,917	59,541,380
Equivalent device hours @ Tj=25C:	4.73E+07	2.51E+08	4.31E+08	2.12E+09
Failure Rate(60% C.L.) in FITS @ Tj=70C:	69.24	13.02	16.74	1.54
Failure Rate(60% C.L.) in FITS @ Tj=55C:	23.48	4.42	5.68	0.52
Failure Rate(60% C.L.) in FITS @ Tj=25C:	1.95	0.37	0.47	0.04



Reliability Testing Summary

High Temperature Life Test Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC3000/A Microcircuit Group
Package Type: PLCC- 84, PGA- 84
Actual Temperature: 145C +8C/-0C
Actual Voltage: 5.7V +/-0.25
Assumed Activation Energy: 0.70 ev @ C.L. = 60%

XC3020/A XC3042/A XC3064/A XC3090/A XC3000/A

Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Lots:	1	7	1	2	11
Failures:	0	0	0	0	0
Device on test:	47	319	129	174	669
Actual device hours:	12,032	299,824	134,160	142,734	588,750
Mean :	256	940	1,040	820	880
Equivalent device hours @ Tj=125C:	31,925	795,539	355,974	378,724	1,562,163
Equivalent device hours @ Tj=70C:	840,010	20,932,117	9,366,337	9,964,929	41,103,393
Equivalent device hours @ Tj=25C:	2.99E+07	7.46E+08	3.34E+08	3.55E+08	1.46E+09

Failure Analysis:

Failure Rate (60% C.L.) in FITS @ Tj=70C:	2.24
Failure Rate (60% C.L.) in FITS @ Tj=55C:	0.76
Failure Rate (60% C.L.) in FITS @ Tj=25C:	0.06



Reliability Testing Summary

High Temperature Life Test Qualification & Monitor Combined

Technology: Si Gate CMOS
 Device Type: XC3100/A Microcircuit Group
 Package Type: PLCC- 84, PGA-175, PQFP-160
 Actual Temperature: 145C +8C/-0C
 Actual Voltage: 5.7V +/-0.25
 Assumed Activation Energy: 0.70 ev @ C.L. = 60%

	XC3130/A	XC3164/A	XC3190/A	XC3195/A	XC3100/A
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Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Lots:	2	1	1	3	7
Failures:	0	0	0	0	0
Device on test:	89	44	47	137	317
Actual device hours:	99,769	88,352	12,032	147,572	347,725
Mean :	1,121	2,008	256	1,077	1,097
Equivalent device hours @ Tj=125C:	264,723	234,429	31,925	391,561	922,638
Equivalent device hours @ Tj=70C:	6,965,341	6,168,267	840,010	10,302,692	24,276,310
Equivalent device hours @ Tj=25C:	2.48E+08	2.20E+08	2.99E+07	3.67E+08	8.65E+08

Failure Analysis:

Failure Rate (60% C.L.) in FITS @ Tj=70C:	3.79
Failure Rate (60% C.L.) in FITS @ Tj=55C:	1.28
Failure Rate (60% C.L.) in FITS @ Tj=25C:	0.11



Reliability Testing Summary

High Temperature Life Test Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4000 Microcircuit Group
Package Type: PLCC-84, PGA-191
Actual Temperature: 145C +8C/-0C
Actual Voltage: 5.7V +/-0.25
Assumed Activation Energy: 0.70 ev @ C.L. = 60%

XC4005

XC4010

XC4000

Period:

Jan. 1, 1997 to Jan. 1, 1999

Combined Lots:	4	1	5
Failures:	0	0	0
Device on test:	180	47	227
Actual device hours:	180,135	12,032	192,167
Mean :	1,001	256	847
Equivalent device hours @ Tj=125C:	477,962	31,925	509,887
Equivalent device hours @ Tj=70C:	12,576,067	840,010	13,416,078
Equivalent device hours @ Tj=25C:	4.48E+08	2.99E+07	4.78E+08

Failure Analysis:

Failure Rate (60% C.L.) in FITS @ Tj=70C:	6.85
Failure Rate (60% C.L.) in FITS @ Tj=55C:	2.32
Failure Rate (60% C.L.) in FITS @ Tj=25C:	0.19



Reliability Testing Summary

High Temperature Life Test Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4000E Microcircuit Group
Package Type: PLCC-84, PGA- 156, 191, 223, 299, CB-164, 228
Actual Temperature: 145C +8C/-0C
Actual Voltage: 5.7V +/-0.25
Assumed Activation Energy: 0.70 ev @ C.L. = 60%

XC4003E XC4005E XC4006E XC4008E XC4010E

Period:	Jan. 1, 1997 to Jan. 1, 1999				
Combined Lots:	6	14	2	1	3
Failures:	0	0	0	0	0
Device on test:	267	753	90	45	137
Actual device hours:	339,588	649,128	99,315	45,405	198,782
Mean :	1,272	862	1,104	1,009	1,451
Equivalent device hours @ Tj=125C:	901,047	1,722,367	63,518	120,476	527,439
Equivalent device hours @ Tj=70C:	23,708,228	45,318,664	6,933,645	3,169,936	13,877,902
Equivalent device hours @ Tj=25C:	8.44E+08	1.61E+09	2.47E+08	1.13E+08	4.49E+08

Failure Analysis:



Reliability Testing Summary

High Temperature Life Test Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4000E Microcircuit Group
Package Type: PLCC-84, PGA- 156, 191, 223, 299, CB-164, 228
Actual Temperature: 145C +8C/-0C
Actual Voltage: 5.7V +/-0.25
Assumed Activation Energy: 0.70 ev @ C.L. = 60%

XC4013E XC4020E XC4025E XC4000E

Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Lots:	8	1	1	36
Failures:	1	0	0	1
Device on test:	521	35	47	1,895
Actual device hours:	637,017	37,100	12,032	2,018,367
Mean :	1,223	1,060	256	1,065
Equivalent device hours @ Tj=125C:	1,690,232	98,439	31,925	5,355,443
Equivalent device hours @ Tj=70C:	44,473,138	2,590,125	840,010	140,911,646
Equivalent device hours @ Tj=25C:	1.58E+09	9.23E+07	2.99E+07	5.02E+09

Failure Analysis: F/A97094(1)-INC

Failure Rate (60% C.L.) in FITS @ Tj=70C:	1.44
Failure Rate (60% C.L.) in FITS @ Tj=55C:	0.49
Failure Rate (60% C.L.) in FITS @ Tj=25C:	0.04



Reliability Testing Summary

High Temperature Operating Life Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4000EX Microcircuit Group
Package Type: PGA-411
Actual Temperature: 145C +8C/-0C
Actual Voltage: 5.7V +/-0.25
Assumed Activation Energy: 0.70 ev @ C.L. = 60%

XC4036EX

XC4000EX

Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Lots:	1	1
Failures:	0	0
Device on test:	45	45
Actual device hours:	21,420	21,420
Mean :	476	476
Equivalent device hours @ Tj=125C:	56,835	56,835
Equivalent device hours @ Tj=70C:	1,495,430	1,495,430
Equivalent device hours @ Tj=25C:	5.33E+07	5.33E+07

Failure Analysis:

Failure Rate (60% C.L.) in FITS @ Tj=70C:	61.44
Failure Rate (60% C.L.) in FITS @ Tj=55C:	20.84
Failure Rate (60% C.L.) in FITS @ Tj=25C:	1.73



Reliability Testing Summary

High Temperature Operating Life Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4000XL Microcircuit Group
Package Type: PLCC-84, PGA-223, 299, 411, 475 , 559, CB-228, HQFP-240
Actual Temperature: 145C +8C/-0C
Actual Voltage: 3.6V +/-0.3
Assumed Activation Energy: 0.70 ev @ C.L. = 60%

XC4002XL

XC4005XL

XC4013XL

XC4020XL

Period:

Jan. 1, 1997 to Jan. 1, 1999

	XC4002XL	XC4005XL	XC4013XL	XC4020XL
Combined Lots:	1	5	3	1
Failures:	0	2	0	0
Device on test:	76	223	207	76
Actual device hours:	230,052	344,902	274,583	77,824
Mean :	3,027	1,547	1,326	1,024
Equivalent device hours @ Tj=125C:	610,410	915,417	728,566	206,495
Equivalent device hours @ Tj=70C:	16,061,007	24,079,223	19,169,924	5,433,258
Equivalent device hours @ Tj=25C:	5.72E+08	8.58E+08	6.83E+08	1.94E+08

Failure Analysis:

F/A97113(1)-FANC
 F/A97137(1)-FANC



Reliability Testing Summary

High Temperature Operating Life Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4000XL Microcircuit Group
Package Type: PLCC-84, PGA-223, 299, 411, 475 , 559, CB-228, HQFP-240
Actual Temperature: 145C +8C/-0C
Actual Voltage: 3.6V +/-0.3
Assumed Activation Energy: 0.70 ev @ C.L. = 60%

XC4028XL

XC4036XL

XC4044XL

Period:

Jan. 1, 1997 to Jan. 1, 1999

Combined Lots:	1	4	2
Failures:	1	1	3
Device on test:	45	191	54
Actual device hours:	45,000	156,624	91,488
Mean :	1,000	820	1,694
Equivalent device hours @ Tj=125C:	119,401	415,579	242,750
Equivalent device hours @ Tj=70C:	3,141,661	10,934,654	6,387,205
Equivalent device hours @ Tj=25C:	1.12E+08	3.89E+08	2.27E+08

Failure Analysis:

F/A98125(1)-INC

F/A98007(1)-VUO

F/A97081(1)-VCMD

F/A97100(2)-VCMD



Reliability Testing Summary

High Temperature Operating Life Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4000XL Microcircuit Group
Package Type: PLCC-84, PGA-223, 299, 411, 475 , 559, CB-228, HQFP-240
Actual Temperature: 145C +8C/-0C
Actual Voltage: 3.6V +/-0.3
Assumed Activation Energy: 0.70 ev @ C.L. = 60%

XC4052XL XC4062XL XC4085XL XC4000XL

Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Lots:	1	4	1	23
Failures:	0	0	0	7
Device on test:	22	107	22	1,023
Actual device hours:	44,352	151,009	5,632	1,421,466
Mean :	2,016	1,411	256	1,390
Equivalent device hours @ Tj=125C:	117,682	400,680	14,944	3,771,653
Equivalent device hours @ Tj=70C:	3,096,421	10,542,645	393,196	99,239,194
Equivalent device hours @ Tj=25C:	1.10E+08	3.75E+08	1.40E+07	3.53E+09

Failure Analysis:

Failure Rate (60% C.L.) in FITS @ Tj=70C:	59.34
Failure Rate (60% C.L.) in FITS @ Tj=55C:	20.12
Failure Rate (60% C.L.) in FITS @ Tj=25C:	1.67



Reliability Testing Summary

High Temperature Operating Life Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XCSXX Microcircuit Group
Package Type: PQFP-240 & PGA-223
Actual Temperature: 145C +8C/-0C
Actual Voltage: 5.7V +/-0.25
Assumed Activation Energy: 0.70 ev @ C.L. = 60%

XCS30

XCS40

XCSXX

Period:

Jan. 1, 1997 to Jan. 1, 1999

	XCS30	XCS40	XCSXX
Combined Lots:	2	2	4
Failures:	1	0	1
Device on test:	148	85	233
Actual device hours:	297,838	55,570	353,408
Mean :	2,012	654	1,517
Equivalent device hours @ Tj=125C:	790,270	147,447	937,717
Equivalent device hours @ Tj=70C:	20,793,465	3,879,602	24,673,066
Equivalent device hours @ Tj=25C:	7.41E+08	1.38E+08	8.79E+08

Failure Analysis:

F/A97094(1)-INC

Failure Rate (60% C.L.) in FITS @ Tj=70C:	8.22
Failure Rate (60% C.L.) in FITS @ Tj=55C:	1.90
Failure Rate (60% C.L.) in FITS @ Tj=25C:	0.23



Reliability Testing Summary

High Temperature Operating Life Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XCSXXXL Microcircuit Group
Package Type: PGA-223
Actual Temperature: 145C +8C/-0C
Actual Voltage: 3.6V +/-0.3
Assumed Activation Energy: 0.70 ev @ C.L. = 60%

XCS30XL

XCSXXXL

Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Lots:	1	1
Failures:	0	0
Device on test:	72	72
Actual device hours:	19,008	19,008
Mean :	264	264
Equivalent device hours @ Tj=125C:	50,435	50,435
Equivalent device hours @ Tj=70C:	1,327,037	1,327,037
Equivalent device hours @ Tj=25C:	4.73E+07	4.73E+07

Failure Analysis:

Failure Rate (60% C.L.) in FITS @ Tj=70C:	69.24
Failure Rate (60% C.L.) in FITS @ Tj=55C:	23.48
Failure Rate (60% C.L.) in FITS @ Tj=25C:	1.95



Reliability Testing Summary

High Temperature Operating Life Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4000XL Microcircuit Group
Package Type: PLCC-84
Actual Temperature: 145C +8C/-0C
Actual Voltage: 3.6V +/-0.3
Assumed Activation Energy: 0.70 ev @ C.L. = 60%

XC4005XL **XC4000XL**
Dynamic

Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Lots:	1	1
Failures:	0	0
Device on test:	43	43
Actual device hours:	152,908	152,908
Mean :	3,556	3,556
Equivalent device hours @ Tj=125C:	405,719	405,719
Equivalent device hours @ Tj=70C:	10,675,223	10,675,223
Equivalent device hours @ Tj=25C:	3.80E+08	3.80E+08

Failure Analysis:

Failure Rate (60% C.L.) in FITS @ Tj=70C:	8.61
Failure Rate (60% C.L.) in FITS @ Tj=55C:	2.92
Failure Rate (60% C.L.) in FITS @ Tj=25C:	0.24



Reliability Testing Summary

High Temperature Operating Life Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4000XV Microcircuit Group
Package Type: PG-299, PG-599
Actual Temperature: 145C +8C/-0C
Actual Voltage: 2.7V +/-0.3(Core);3.6V+/-0.3(I/O)
Assumed Activation Energy: 0.70 ev @ C.L. = 60%

XC4036XV

XC40125XV

XC4000XV

Period:

Jan. 1, 1997 to Jan. 1, 1999

	XC4036XV	XC40125XV	XC4000XV
Combined Lots:	2	1	3
Failures:	0	0	0
Device on test:	90	20	110
Actual device hours:	91,170	9,884	101,054
Mean :	1,013	494	919
Equivalent device hours @ Tj=125C:	241,906	26,226	268,132
Equivalent device hours @ Tj=70C:	6,365,004	690,048	7,055,053
Equivalent device hours @ Tj=25C:	2.27E+08	2.46E+07	2.51E+08

Failure Analysis:

Failure Rate (60% C.L.) in FITS @ Tj=70C:	13.02
Failure Rate (60% C.L.) in FITS @ Tj=55C:	4.42
Failure Rate (60% C.L.) in FITS @ Tj=25C:	0.37



Reliability Testing Summary High Temperature Operating Life Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4000XLA Microcircuit Group
Package Type: PGA-223
Actual Temperature: 145C +8C/-0C
Actual Voltage: 3.6V +/-0.3
Assumed Activation Energy: 0.70 ev @ C.L. = 60%

XC4036XLA

XC4085XLA

XC4000XLA

Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Lots:	3	1	4
Failures:	1	0	1
Device on test:	150	37	187
Actual device hours:	149,673	23,828	173,501
Mean :	998	644	928
Equivalent device hours @ Tj=125C:	397,136	63,224	460,360
Equivalent device hours @ Tj=70C:	10,449,373	1,663,544	12,112,917
Equivalent device hours @ Tj=25C:	3.72E+08	5.92E+07	4.31E+08

Failure Analysis:

F/A98091(1)-RAND

Failure Rate (60% C.L.) in FITS @ Tj=70C:	16.74
Failure Rate (60% C.L.) in FITS @ Tj=55C:	5.68
Failure Rate (60% C.L.) in FITS @ Tj=25C:	0.47



Reliability Testing Summary

High Temperature Life Test Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC5000 Microcircuit Group
Package Type: PLCC-84, PGA-223, 299
Actual Temperature: 145C +8C/-0C
Actual Voltage: 5.7V +/-0.25
Assumed Activation Energy: 0.70 ev @ C.L. = 60%

	XC5202	XC5204	XC5210	XC5215	XC5000
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Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Lots:	1	4	2	2	9
Failures:	0	0	0	0	0
Device on test:	45	261	90	123	519
Actual device hours:	45,540	589,311	92,610	125,388	852,849
Mean :	1,012	2,258	1,029	1,019	1,643
Equivalent device hours @ Tj=125C:	120,834	1,563,651	245,727	332,699	2,262,911
Equivalent device hours @ Tj=70C:	3,179,361	41,142,559	6,465,538	8,753,923	59,541,380
Equivalent device hours @ Tj=25C:	1.13E+08	1.47E+09	2.30E+08	3.12E+08	2.12E+09

Failure Analysis:

Failure Rate (60% C.L.) in FITS @ Tj=70C:	1.54
Failure Rate (60% C.L.) in FITS @ Tj=55C:	0.52
Failure Rate (60% C.L.) in FITS @ Tj=25C:	0.04



Reliability Testing Summary-Packages Bias Moisture Life Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC3000/A, XC3100/A, XC4000, XC4000E, XC4000EX
Package Type: Various
Test Condition: T=85C, R.H.=85%
Bias Voltages: 5.0V +/- .25V

	XC3000/A	XC3100/A	XC4000	XC4000E	XC4000EX
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Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	3	1	10	15	1
Combined Completed Lots:	3	1	10	15	1
Failures:	0	0	0	1	0
Device on test:	180	44	545	828	60
Mean Test Hour s/Device:	1,053	1,009	1,327	1,091	1,000
Total Device Hours:	189,540	44,396	722,975	903,262	60,000



Reliability Testing Summary-Packages Bias Moisture Life Qualification & Monitor Combined

Technology: Si Gate CMOS
 Device Type: XC4000XL, XC4000XV, XC4000XLA, XC5000,
 Package Type: Various
 Test Condition: T=85C, R.H.=85%
 Bias Voltages: 5.0V +/- .25V
 * 3.3V +/-0.3 **2.7V +/- .3V

XC4000XL*	XC4000XV**	XC4000XLA	XC5000
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Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	10	1	1	3
Combined Completed Lots:	10	1	1	3
Failures:	1	0	0	0
Device on test:	419	74	76	135
Mean Test Hour s/Device:	1,018	1,084	1,022	1,046
Total Device Hours:	426,320	80,216	77,672	141,165



Reliability Testing Summary-Packages Bias Moisture Life Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC3000/A Microcircuit Group
Package Type: PPGA-132, PLCC-84, PQFP-100, VQFP-100
Test Condition: T = 85C, R.H. = 85%
Bias Voltages: 5.0V +/- .25V

	XC3030/A	XC3042/A	XC3064/A	XC3000/A
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Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	1	1	1	3
Combined Completed Lots:	1	1	1	3
Failures:	0	0	0	0
Device on test:	45	90	45	180
Mean Test Hour s/Device:	1,039	1,086	1,001	1,053
Total Device Hours:	46,755	97,740	45,045	189,540
Failure Analysis Number:				



Reliability Testing Summary-Packages Bias Moisture Life Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC3100/A Microcircuit Group
Package Type: PPGA-175
Test Condition: T = 85C, R.H. = 85%
Bias Voltages: 5.0V +/- .25V

XC3190/A

XC3100/A

Period:	Jan. 1, 1997 to Jan. 1, 1999	
Combined Started Lot:	1	1
Combined Completed Lots:	1	1
Failures:	0	0
Device on test:	44	44
Mean Test Hour s/Device:	1,009	1,009
Total Device Hours:	44,396	44,396
Failure Analysis Number:		



Reliability Testing Summary-Packages Bias Moisture Life Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4000 Microcircuit Group
Package Type: PLCC-84, BGA-225
 PQFP- 208, 240 & VQFP-100
Test Condition: T = 85C, R.H. = 85%
Bias Voltages: 5.0V +/- .25V

	XC4003	XC4008	XC4010	XC4013	XC4000
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Period:	Jan. 1, 1997 to Jan. 1, 1999				
Combined Started Lot:	1	1	5	3	10
Combined Completed Lots:	1	1	5	3	10
Failures:	0	0	0	0	0
Device on test:	75	45	273	152	545
Mean Test Hour s/Device:	1,030	1,000	1,482	1,290	1,327
Total Device Hours:	77,250	45,000	404,646	196,079	722,975
Failure Analysis Number:					



Reliability Testing Summary-Packages Bias Moisture Life Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4000E Microcircuit Group
Package Type: PQFP-208, 240, PLCC-84, HQFP-208, 240,
 BGA-225, VQFP-100, TQFP-144
Test Condition: T = 85C, R.H. = 85%
Bias Voltages: 5.0V +/- .25V

	XC4003E	XC4005E	XC4006E	XC4010E
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Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	1	1	1	1
Combined Completed Lots:	1	1	1	1
Failures:	0	0	0	0
Device on test:	45	45	45	41
Mean Test Hour s/Device:	1,285	1,001	1,001	1,079
Total Device Hours:	57,825	45,045	45,045	44,239
Failure Analysis Number:				



Reliability Testing Summary-Packages Bias Moisture Life Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4000E Microcircuit Group
Package Type: PQFP-208, 240, PLCC-84, HQFP-208, 240,
 BGA-225, VQFP-100, TQFP-144
Test Condition: T = 85C, R.H. = 85%
Bias Voltages: 5.0V +/- .25V

XC4013E

XC4025E

XC4000E

Period:

Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	9	2	15
Combined Completed Lots:	9	2	15
Failures:	0	1	1
Device on test:	532	120	828
Mean Test Hour s/Device:	1,112	995	1,091
Total Device Hours:	591,608	119,500	903,262
Failure Analysis Number:		F/A97019(1) INC	



Reliability Testing Summary-Packages Bias Moisture Life Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4000EX Microcircuit Group
Package Type: HQFP- 240,
Test Condition: T = 85C, R.H. = 85%
Bias Voltages: 5.0V +/- .25V

XC4036EX

XC4000EX

Period:	Jan. 1, 1997 to Jan. 1, 1999	
Combined Started Lot:	1	1
Combined Completed Lots:	1	1
Failures:	0	0
Device on test:	60	60
Mean Test Hour s/Device:	1,000	1,000
Total Device Hours:	60,000	60,000
Failure Analysis Number:		



Reliability Testing Summary-Packages Bias Moisture Life Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4000XL Microcircuit Group
Package Type: HQFP-240, BGA-560
Test Condition: T = 85C, R.H. = 85%
Bias Voltages: 3.3V +/- .3V

XC4013XL

XC4020XL

XC4036XL

Period:

Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	1	1	4
Combined Completed Lots:	1	1	4
Failures:	1	0	0
Device on test:	75	45	181
Mean Test Hour s/Device:	1,008	1,041	1,021
Total Device Hours:	75,600	46,845	184,711
Failure Analysis Number:	F/A 98062(1)-FANC		



Reliability Testing Summary-Packages Bias Moisture Life Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4000XL Microcircuit Group
Package Type: HQFP-208, 240, BGA-560, HT-144
Test Condition: T = 85C, R.H. = 85%
Bias Voltages: 3.3V +/- .3V

XC4062XL

XC4085XL

XC4000XL

Period:	Jan. 1, 1997 to Jan. 1, 1999	
Combined Started Lot:	3	10
Combined Completed Lots:	3	10
Failures:	0	1
Device on test:	100	419
Mean Test Hour s/Device:	1,012	1,018
Total Device Hours:	101,146	426,320
Failure Analysis Number:		



Reliability Testing Summary-Packages Bias Moisture Life Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4000XV Microcircuit Group
Package Type: HQFP-240
Test Condition: T = 85C, R.H. = 85%
Bias Voltages: 2.7V +/- .3V

XC4036XV

XC4000XV

Period:	Jan. 1, 1997 to Jan. 1, 1999	
Combined Started Lot:	1	1
Combined Completed Lots:	1	1
Failures:	0	0
Device on test:	74	74
Mean Test Hour s/Device:	1,084	1,084
Total Device Hours:	80,216	80,216
Failure Analysis Number:		



Reliability Testing Summary-Packages Bias Moisture Life Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4000XLA Microcircuit Group
Package Type: HQFP-208
Test Condition: T = 85C, R.H. = 85%
Bias Voltages: 3.3V +/- .3V

XC4036XLA

XC4000XLA

	XC4036XLA	XC4000XLA
Period:	Jan. 1, 1997 to Jan. 1, 1999	
Combined Started Lot:	1	1
Combined Completed Lots:	1	1
Failures:	0	0
Device on test:	76	76
Mean Test Hour s/Device:	1,022	1,022
Total Device Hours:	77,672	77,672
Failure Analysis Number:		



Reliability Testing Summary-Packages Bias Moisture Life Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC5000 Microcircuit Group
Package Type: HQFP-240, PQFP-208, TQFP-144
Test Condition: T = 85C, R.H. = 85%
Bias Voltages: 5.0V +/- .25V

	XC5204	XC5206	XC5215	XC5000
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Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	1	1	1	3
Combined Completed Lots:	1	1	1	3
Failures:	0	0	0	0
Device on test:	45	45	45	135
Mean Test Hour s/Device:	1,056	1,038	1,043	1,046
Total Device Hours:	47,520	46,710	46,935	141,165
Failure Analysis Number:				



Reliability Testing Summary-Packages Pressure Pot Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC3000/A, XC3100/A, & XC4000
Package Type: Various
Test Condition: T=121C; 2 atm. sat. steam

XC3000/A

XC3100/A

XC4000

Period:	Jan. 1, 1997 to Jan. 1, 1999		
Combined Started Lot:	5	2	19
Combined Completed Lots:	5	2	19
Failures:	0	0	0
Device on test:	194	90	1,108
Mean Test Hour s/Device:	123	96	133
Total Device Hours:	23,952	8,640	147,598



Reliability Testing Summary-Packages Pressure Pot Qualification & Monitor Combined

Technology: Si Gate CMOS
 Device Type: XC4000E, XC4000EX, XC4000XL, XC5000
 Package Type: Various
 Test Condition: T=121C; 2 atm. sat. steam

	XC4000E	XC4000EX	XC4000XL	XC5000
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Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	13	5	12	4
Combined Completed Lots:	13	5	12	4
Failures:	0	1	0	2
Device on test:	576	233	384	179
Mean Test Hour s/Device:	120	105	139	114
Total Device Hours:	69,264	24,432	53,352	20,352



Reliability Testing Summary-Packages Pressure Pot Qualification & Monitor Combined

Technology: Si Gate CMOS
 Device Type: XC3000/A Microcircuit Group
 Package Type: PLCC-44, 84, VQFP-100, PPGA-132, PQFP-100
 Test Condition: T = 121C; 2 atm. sat. steam.

	XC3030/A	XC3042/A	XC3064/A	XC3000/A
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Period:	Jan. 1, 1997 to Jan. 1, 1999			
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Combined Started Lot:	2	2	1	5
Combined Completed Lots:	2	2	1	5
Failures:	0	0	0	0
Device on test:	59	90	45	194
Mean Test Hour s/Device:	113	96	96	123
Total Device Hours:	6,672	12,960	4,320	23,952
Failure Analysis Number:				



Reliability Testing Summary-Packages Pressure Pot Qualification & Monitor Combined

Technology: Si Gate CMOS
 Device Type: XC3100/A Microcircuit Group
 Package Type: PPGA-175, TQFP-176
 Test Condition: T = 121C; 2 atm. sat. steam.

XC3190/A

XC3100/A

Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	2	2
Combined Completed Lots:	2	2
Failures:	0	0
Device on test:	90	90
Mean Test Hour s/Device:	96	96
Total Device Hours:	8,640	8,640
Failure Analysis Number:		



Reliability Testing Summary-Packages Pressure Pot Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4000 Microcircuit Group
Package Type: PQFP-160, 208 VQFP-100, HQFP-208, 240
 PLCC-84, BGA-225, & TQFP-144, 176
Test Condition: T = 121C; 2 atm. sat. steam

	XC4003	XC4005	XC4006	XC4008
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Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	1	3	1	1
Combined Completed Lots:	1	3	1	1
Failures:	0	0	0	0
Device on test:	78	196	44	45
Mean Test Hour s/Device:	192	96	96	96
Total Device Hours:	14,976	18,814	4,224	4,320
Failure Analysis Number:				



Reliability Testing Summary-Packages Pressure Pot Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4000 Microcircuit Group
Package Type: PQFP-160, 208 VQFP-100, HQFP-208, 240
 PLCC-84, BGA-225, & TQFP-144, 176
Test Condition: T = 121C; 2 atm. sat. steam

XC4010 **XC4013** **XC4025** **XC4000**



Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	8	4	1	19
Combined Completed Lots:	8	4	1	19
Failures:	0	0	0	0
Device on test:	431	270	44	1,108
Mean Test Hour s/Device:	139	137	192	133
Total Device Hours:	59,952	36,864	8,448	147,598
Failure Analysis Number:				



Reliability Testing Summary-Packages Pressure Pot Qualification & Monitor Combined

Technology: Si Gate CMOS
 Device Type: XC4000E Microcircuit Group
 Package Type: HQFP-208, 240, PQFP-208, 240, BGA-225,
 TQFP-144, VQFP-100, PLCC-84
 Test Condition: T = 121C; 2 atm. sat. steam

XC4003E

XC4005E

XC4006E



Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	1	1	1
Combined Completed Lots:	1	1	1
Failures:	0	0	0
Device on test:	44	44	43
Mean Test Hour s/Device:	168	96	96
Total Device Hours:	7,392	4,224	4,128
Failure Analysis Number:			



Reliability Testing Summary-Packages Pressure Pot Qualification & Monitor Combined

Technology: Si Gate CMOS
 Device Type: XC4000E Microcircuit Group
 Package Type: HQFP-208, 240, PQFP-208, 240, BGA-225,
 TQFP-144, VQFP-100, PLCC-84
 Test Condition: T = 121C; 2 atm. sat. steam

	XC4010E	XC4013E	XC4025E	XC4000E
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Period:	Jan. 1, 1997 to Jan. 1, 1999			
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Combined Started Lot:	1	6	3	13
Combined Completed Lots:	1	6	3	13
Failures:	0	0	0	0
Device on test:	43	298	104	576
Mean Test Hour s/Device:	96	118	138	120
Total Device Hours:	4,128	35,088	14,304	69,264
Failure Analysis Number:				



Reliability Testing Summary-Packages Pressure Pot Qualification & Monitor Combined

Technology: Si Gate CMOS
 Device Type: XC4000EX Microcircuit Group
 Package Type: HQFP-208, 240, BGA-352, 432
 Test Condition: T = 121C; 2 atm. sat. steam

XC4028EX

XC4036EX

XC4000EX



Period:	Jan. 1, 1997 to Jan. 1, 1999		
Combined Started Lot:	2	3	5
Combined Completed Lots:	2	3	5
Failures:	1	0	1
Device on test:	76	157	233
Mean Test Hour s/Device:	126	95	105
Total Device Hours:	9,600	14,832	24,432
Failure Analysis Number:	F/A98003(1)-FANC		



Reliability Testing Summary-Packages Pressure Pot Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4000XL Microcircuit Group
Package Type: HQFP-240, 304, BGA-256,352, 432, 560
 TQFP-176, HT-144
Test Condition: T = 121C; 2 atm. sat. steam

XC4010XL

XC4020XL

XC4036XL



Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	1	2	2
Combined Completed Lots:	1	2	2
Failures:	0	0	0
Device on test:	76	117	44
Mean Test Hour s/Device:	168	143	96
Total Device Hours:	12,768	16,704	4,224
Failure Analysis Number:			



Reliability Testing Summary-Packages Pressure Pot Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4000XL Microcircuit Group
Package Type: HQFP-240, 304, BGA-256,352, 432, 560
 TQFP-176, HT-144
Test Condition: T = 121C; 2 atm. sat. steam

XC4062XL

XC4085XL

XC4000XL



Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	6	1	12
Combined Completed Lots:	6	1	12
Failures:	0	0	0
Device on test:	142	5	384
Mean Test Hour s/Device:	135	96	139
Total Device Hours:	19,176	480	53,352
Failure Analysis Number:			



Reliability Testing Summary-Packages Pressure Pot Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC5000 Microcircuit Group
Package Type: HQFP-240, PQFP-160, 208, TQFP-144
Test Condition: T = 121C; 2 atm. sat. steam

	XC5204	XC5206	XC5215	XC5000
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Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	1	2	1	4
Combined Completed Lots:	1	2	1	4
Failures:	0	2	0	2
Device on test:	45	90	44	179
Mean Test Hour s/Device:	96	96	168	114
Total Device Hours:	4,320	8,640	7,392	20,352
Failure Analysis Number:	F/A98043(2)-MST			



Reliability Testing Summary-Packages Temperature Cycle (Air to Air) Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC3000/A, XC3100/A, XC4000, XCSXX
Package Type: Various
Test Condition: T = -65C / +150C (Air to Air)

	XC3000/A	XC3100/A	XCSXX	XC4000
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Period:	Jan. 1, 1997 to Jan. 1, 1999			
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Combined Started Lot:	7	3	4	16
Combined Completed Lots:	7	3	4	16
Failures:	0	0	0	0
Device on test:	336	158	190	976
Mean Test Cycles/Device:	1,041	1,018	1,023	1,095
Total Device Cycles:	340,826	160,880	194,328	1,068,766
Failure Analysis Number:				



Reliability Testing Summary-Packages Temperature Cycle (Air to Air) Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4000E, XC4000XL, XC4000EX, XC5000
Package Type: Various
Test Condition: T = -65C / +150C (Air to Air)
 T = -55C / +125C (Air to Air) for BGA

	XC4000EX	XC4000XL	XC4000XLA	XC4000E	XC5000
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Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	5	18	1	22	5
Combined Completed Lots:	5	18	1	22	5
Failures:	0	0	0	2	0
Device on test:	227	574	16	1,030	228
Mean Test Cycles/Device:	1,028	960	1,004	956	1,061
Total Device Cycles:	233,324	550,750	16,064	985,003	241,925
Failure Analysis Number:					



Reliability Testing Summary-Packages Temperature Cycle (Air to Air) Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC3000/A Microcircuit Group
Package Type: PLCC- 44, 84, VQFP-100,
 PQFP-100, 160
Test Condition: T = -65C/+150C (Air to Air)

	XC3030/A	XC3042/A	XC3064/A	XC3090/A	XC3000/A
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Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	3	2	1	1	7
Combined Completed Lots:	3	2	1	1	7
Failures:	0	0	0	0	0
Device on test:	131	90	42	73	336
Mean Test Cycles/Device:	1,168	1,053	1,047	673	1,041
Total Device Cycles:	152,953	94,770	43,974	49,129	340,826
Failure Analysis Number:					



Reliability Testing Summary-Packages Temperature Cycle (Air to Air) Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC3100/A Microcircuit Group
Package Type: PLCC-84, TQFP-176, PPGA-175
Test Condition: T = -65C/+150C (Air to Air)

XC3190/A

XC3195/A

XC3100/A



Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	2	1	3
Combined Completed Lots:	2	1	3
Failures:	0	0	0
Device on test:	90	68	158
Mean Test Cycles/Device:	1,032	1,000	1,018
Total Device Cycles:	92,880	68,000	160,880
Failure Analysis Number:			



Reliability Testing Summary-Packages Temperature Cycle (Air to Air) Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XCSXX Microcircuit Group
Package Type: TQFP-144,VQFP-100, PQFP-208
Test Condition: T = -65C/+150C (Air to Air)

XCS30

XCSXX



Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	4	4
Combined Completed Lots:	4	4
Failures:	0	0
Device on test:	190	190
Mean Test Cycles/Device:	1,023	1,023
Total Device Cycles:	194,328	194,328
Failure Analysis Number:		



Reliability Testing Summary-Packages Temperature Cycle (Air to Air) Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4000 Microcircuit Group
Package Type: PQFP-160,208, 240, HQFP-240, TQFP-144
 PLCC-84, VQFP-100, BG-225
Test Condition: T = -65C/+150C (Air to Air)
 *For BGA, T=-55C/+125C (Air to Air)

	XC4003	XC4005	XC4006	XC4008	XC4010
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Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	1	2	1	1	5
Combined Completed Lots:	1	2	1	1	5
Failures:	0	0	0	0	0
Device on test:	78	123	45	45	257
Mean Test Cycle/Device:	2,008	1,008	1,004	514	1,124
Total Device Cycles:	156,624	124,042	45,180	23,130	288,977



Reliability Testing Summary-Packages Temperature Cycle (Air to Air) Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4000 Microcircuit Group
Package Type: PQFP-160,208, 240, HQFP-240, TQFP-144
 PLCC-84, VQFP-100, BG-225
Test Condition: T = -65C/+150C (Air to Air)
 *For BGA, T=-55C/+125C (Air to Air)

	XC4010*	XC4013	XC4025	XC4000
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Period:	Jan. 1, 1997 to Jan. 1, 1999
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Combined Started Lot:	2	3	1	16
Combined Completed Lots:	2	3	1	16
Failures:	0	0	0	0
Device on test:	121	229	78	976
Mean Test cycles/Device:	1,007	1,175	510	1,095
Total Device Cycles:	121,900	269,133	39,780	1,068,766



Reliability Testing Summary-Packages Temperature Cycle (Air to Air) Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4000E Microcircuit Group
Package Type: PQFP-208, 240, VQFP-100, TQFP-144
 PLCC-84, HQFP-208, 240, BG-225
Test Condition: T = -65C/+150C (Air to Air)
 *For BGA, T=-55C/+125C (Air to Air)

	XC4003E	XC4005E	XC4006E	XC4013E	XC4020E
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Period:	Jan. 1, 1997 to Jan. 1, 1999
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Combined Started Lot:	1	1	1	10	1
Combined Completed Lots:	1	1	1	10	1
Failures:	0	0	0	2	0
Device on test:	45	45	45	523	25
Mean Test Cycles/Device:	1,098	1,016	1,096	916	245
Total Device Cycles:	49,410	45,720	49,320	479,083	6,125

F/A97098(2)-FANC



Reliability Testing Summary-Packages Temperature Cycle (Air to Air) Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4000E Microcircuit Group
Package Type: PQFP-208, 240, VQFP-100, TQFP-144
 PLCC-84, HQFP-208, 240, BG-225
Test Condition: T = -65C/+150C (Air to Air)
 *For BGA, T=-55C/+125C (Air to Air)

	XC4013E*	XC4010E*	XC4025E	XC4000E
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Period:	Jan. 1, 1997 to Jan. 1, 1999
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Combined Started Lot:	1	1	6	22
Combined Completed Lots:	1	1	6	22
Failures:	0	0	0	2
Device on test:	45	45	257	1,030
Mean Test Cycles/Device:	1,002	1,063	1,021	956
Total Device Cycles:	45,090	47,835	262,420	985,003



Reliability Testing Summary-Packages Temperature Cycle (Air to Air) Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4000EX Microcircuit Group
Package Type: HQFP-240, 304, BGA-352
Test Condition: T = -65C/+150C (Air to Air)
 *For BGA, T=-55C/+125C (Air to Air)

	XC4028EX	XC4036EX	XC4036EX*	XC4000EX
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Period:	Jan. 1, 1997 to Jan. 1, 1999
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Combined Started Lot:	1	3	1	5
Combined Completed Lots:	1	3	1	5
Failures:	0	0	0	0
Device on test:	45	106	76	227
Mean Test cycles/Device:	1,160	992	1,000	1,028
Total Device Cycles:	52,200	105,124	76,000	233,324



Reliability Testing Summary-Packages Temperature Cycle (Air to Air) Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4000XL Microcircuit Group
Package Type: HQFP-240, BGA-256,352,432, 560
 PGA-411, 475, 559, PQFP-160, TQFP-176
Test Condition: T = -65C/+150C (Air to Air)
 *For BGA, T=-55C/+125C (Air to Air)

XC4010XL XC4020XL XC4020XL* XC4036XL

Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	1	1	1	4
Combined Completed Lots:	1	1	1	4
Failures:	0	0	0	0
Device on test:	76	45	75	144
Mean Test Cycles/Device:	1,065	200	1,087	947
Total Device cycles:	80,940	9,000	81,525	136,352



Reliability Testing Summary-Packages Temperature Cycle (Air to Air) Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4000XL Microcircuit Group
Package Type: HQFP-240, BGA-256,352,432, 560
 PGA-411, 475, 559, PQFP-160
Test Condition: T = -65C/+150C (Air to Air)
 *For BGA, T=-55C/+125C (Air to Air)

	XC4036XL*	XC4052XL	XC4062XL	XC4062XL*
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Period:	Jan. 1, 1997 to Jan. 1, 1999			
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Combined Started Lot:	2	1	3	3
Combined Completed Lots:	2	1	3	3
Failures:	0	0	0	0
Device on test:	44	32	57	62
Mean Test Cycles/Device:	1,017	1,012	1,053	1,063
Total Device cycles:	44,748	32,384	59,999	65,914



Reliability Testing Summary-Packages Temperature Cycle (Air to Air) Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4000XL Microcircuit Group
Package Type: HQFP-240, BGA-256,352,432, 560
 PGA-411, 475, 559, PQFP-160
Test Condition: T = -65C/+150C (Air to Air)
 *For BGA, T=-55C/+125C (Air to Air)

XC4085XL

XC4085XL*

XC4000XL

Period:

Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	1	1	18
Combined Completed Lots:	1	1	18
Failures:	0	0	0
Device on test:	21	18	574
Mean Test Cycles/Device:	1,038	1,005	960
Total Device Cycles:	21,798	18,090	550,750



Reliability Testing Summary-Packages Temperature Cycle (Air to Air) Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4000XLA Microcircuit Group
Package Type: HQFP-240,
Test Condition: T = -65C/+150C (Air to Air)

XC4085XLA

XC4000XLA

Period:

Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	1	1
Combined Completed Lots:	1	1
Failures:	0	0
Device on test:	16	16
Mean Test Cycles/Device:	1,004	1,004
Total Device Cycles:	16,064	16,064



Reliability Testing Summary-Packages Temperature Cycle (Air to Air) Qualification & Monitor Combined

Technology: Si Gate CMOS
 Device Type: XC5000 Microcircuit Group
 Package Type: PLCC-84, HQFP-240, TQFP-144, PQFP-160, 208
 Test Condition: T = -65C/+150C (Air to Air)

	XC5202	XC5204	XC5206	XC5215	XC5000
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Period:	Jan. 1, 1997 to Jan. 1, 1999				
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Combined Started Lot:	1	1	2	1	5
Combined Completed Lots:	1	1	2	1	5
Failures:	0	0	0	0	0
Device on test:	49	45	90	44	228
Mean Test Cycles/Device:	1,118	1,040	1,070	1,002	1,061
Total Device Cycles:	54,782	46,800	96,255	44,088	241,925
Failure Analysis Number:					



Reliability Testing Summary-Packages Hast Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC3100/A, XC4000/E, XC4000XLA, XCSXX Microcircuit Group
Package Type: Various
Test Condition: T = 130C, R.H. = 85%, 2ATM
Bias Voltage: 5.0V +/- .25V

	XC3100/A	XC4000	XC4000E	XC4000XLA	XCSXX
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Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	1	5	6	1	1
Combined Completed Lots:	1	5	6	1	1
Failures:	0	0	1	0	0
Device on test:	22	90	69	12	13
Mean Test Hours/Device:	200	153	254	500	100
Total Device Hours:	4,400	13,800	17,500	6,000	1,300



Reliability Testing Summary-Packages Hast Qualification & Monitor Combined

Technology: Si Gate CMOS
 Device Type: XC3100/A Microcircuit Group
 Package Type: PLCC-84
 Test Condition: T = 130C, R.H. = 85%, 2ATM
 Bias Voltage: 5.0V +/- .25V

XC3195/A

XC3100/A

	XC3195/A	XC3100/A
Period:	Jan. 1, 1997 to Jan. 1, 1999	
Combined Started Lot:	1	1
Combined Completed Lots:	1	1
Failures:	0	0
Device on test:	22	22
Mean Test Hours/Device:	200	200
Total Device Hours:	4,400	4,400



Reliability Testing Summary-Packages Hast Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4000 Microcircuit Group
Package Type: PQFP-240, PLCC-84, HQFP-240
Test Condition: T = 130C, R.H. = 85%, 2ATM
Bias Voltage: 5.0V +/- .25V

XC4010

XC4013

XC4000

Period:

Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	3	2	5
Combined Completed Lots:	3	2	5
Failures:	0	0	0
Device on test:	66	24	90
Mean Test Hours/Device:	100	300	153
Total Device Hours:	6,600	7,200	13,800



Reliability Testing Summary-Packages Hast Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4000E Microcircuit Group
Package Type: HQFP-240, PQFP-240
Test Condition: T = 130C, R.H. = 85%, 2ATM
Bias Voltage: 5.0V +/- .25V

XC4025E

XC4000E

Period:

Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	6	6
Combined Completed Lots:	6	6
Failures:	1	1
Device on test:	69	69
Mean Test Hours/Device:	254	254
Total Device Hours:	17,500	17,500

F/A97114(1)-FANC



Reliability Testing Summary-Packages Hast Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4000XLAMicrocircuit Group
Package Type: HQFP-240
Test Condition: T = 130C, R.H. = 85%, 2ATM
Bias Voltage: 5.0V +/- .25V

XC4036XLA

XC4000XLA

	XC4036XLA	XC4000XLA
Period:	Jan. 1, 1997 to Jan. 1, 1999	
Combined Started Lot:	1	1
Combined Completed Lots:	1	1
Failures:	0	0
Device on test:	12	12
Mean Test Hours/Device:	500	500
Total Device Hours:	6,000	6,000



Reliability Testing Summary-Packages Hast Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XCSXX Microcircuit Group
Package Type: HQFP-240
Test Condition: T = 130C, R.H. = 85%, 2ATM
Bias Voltage: 5.0V +/- .25V

XCS40

XCSXX

	XCS40	XCSXX
Period:	Jan. 1, 1997 to Jan. 1, 1999	
Combined Started Lot:	1	1
Combined Completed Lots:	1	1
Failures:	0	0
Device on test:	13	13
Mean Test Hours/Device:	100	100
Total Device Hours:	1,300	1,300



The CPLD & EPROM Products

Reliability Testing Summary

High Temperature Life Test Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC1700D, XC1700E, XC1700L
Package Type: Various
Actual Temperature: 145C (150C for XC7000)
Actual Voltage: 5.7V +/-0.25, 3.3V +/-0.3V
Assumed Activation Energy: 0.58 ev for Eprom; 0.7 e.v. for XC7000 &XC9500

XC1700D

XC1700E

XC1700/L

Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Lots:	7	4	3
Failures:	0	1	1
Device on test:	658	366	226
Actual device hours:	729,455	675,975	307,089
Mean :	1,109	1,847	1,359
Equivalent device hours @ Tj=125C:	1,637,356	1,517,313	689,301
Equivalent device hours @ Tj=70C:	24,594,619	22,791,464	10,353,945
Equivalent device hours @ Tj=25C:	4.75E+08	4.40E+08	2.00E+08
Failure Rate (60% C.L.) in FITS @ Tj=70C:	3.73	8.89	19.50
Failure Rate (60% C.L.) in FITS @ Tj=55C:	1.52	3.63	7.99
Failure Rate (60% C.L.) in FITS @ Tj=25C:	0.19	0.46	1.02

Failure Analysis:



Reliability Testing Summary

High Temperature Life Test Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC17SXX, XC7000, XC9500
Package Type: Various
Actual Temperature: 145C (150C for XC7000)
Actual Voltage: 5.7V +/-0.25, 3.3V +/-0.3V
Assumed Activation Energy: 0.58 ev for Eprom; 0.7 e.v. for XC7000 &XC9500

XC17SXX

XC9500

	XC17SXX	XC9500
Period:	Jan. 1, 1997 to Jan. 1, 1999	
Combined Lots:	6	17
Failures:	2	4
Device on test:	518	1,194
Actual device hours:	832,992	1,695,112
Mean :	1,608	1,420
Equivalent device hours @ Tj=125C:	1,869,758	4,497,733
Equivalent device hours @ Tj=70C:	28,085,517	118,343,702
Equivalent device hours @ Tj=25C:	5.42E+08	4.21E+09
Failure Rate (60% C.L.) in FITS @ Tj=70C:	22.17	10.61
Failure Rate (60% C.L.) in FITS @ Tj=55C:	9.05	3.60
Failure Rate (60% C.L.) in FITS @ Tj=25C:	1.15	0.3
Failure Analysis:		



Reliability Testing Summary

High Temperature Life Test Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC1700D Microcircuit Group
Package Type: PD8, DD8, PLCC-20
Actual Temperature: 145C +8C/-0C
Actual Voltage: 5.7V +/-0.25
Assumed Activation Energy: 0.58 ev @ C.L. = 60%

XC1736D XC1765D XC17128D XC17256D XC1700D

Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Lots:	1	3	1	2	7
Failures:	0	0	0	0	0
Device on test:	107	321	107	123	658
Actual device hours:	109,782	341,223	111,494	166,956	729,455
Mean :	1,026	1,063	1,042	1,357	1,109
Equivalent device hours @ Tj=125C:	246,420	765,919	250,263	374,754	1,637,356
Equivalent device hours @ Tj=70C:	3,701,457	11,504,822	3,759,180	5,629,160	24,594,619
Equivalent device hours @ Tj=25C:	7.15E+07	2.22E+08	7.26E+07	1.09E+08	4.75E+08

Failure Analysis:

Failure Rate (60% C.L.) in FITS @ Tj=70C:	3.73
Failure Rate (60% C.L.) in FITS @ Tj=55C:	1.52
Failure Rate (60% C.L.) in FITS @ Tj=25C:	0.19



Reliability Testing Summary

High Temperature Life Test Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC1700/L Microcircuit Group
Package Type: PD8
Actual Temperature: 145C +8C/-0C
Actual Voltage: 3.3V +/-0.3V
Assumed Activation Energy: 0.58 ev @ C.L. = 60%

XC1701

XC1701L

XC1700/L

Period:

Jan. 1, 1997 to Jan. 1, 1999

	XC1701	XC1701L	XC1700/L
Combined Lots:	1	2	3
Failures:	0	1	1
Device on test:	74	152	226
Actual device hours:	150,072	157,017	307,089
Mean :	2,028	1,033	1,359
Equivalent device hours @ Tj=125C:	352,445	352,445	689,301
Equivalent device hours @ Tj=70C:	5,294,053	5,294,053	10,353,945
Equivalent device hours @ Tj=25C:	1.02E+08	1.02E+08	2.00E+08

Failure Analysis:

F/A98117(1)-FANC

Failure Rate (60% C.L.) in FITS @ Tj=70C:	19.50
Failure Rate (60% C.L.) in FITS @ Tj=55C:	7.99
Failure Rate (60% C.L.) in FITS @ Tj=25C:	1.02



Reliability Testing Summary High Temperature Life Test Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC1700E Microcircuit Group
Package Type: PD8
Actual Temperature: 145C +8C/-0C
Actual Voltage: 5.7V +/-0.25
Assumed Activation Energy: 0.58 ev @ C.L. = 60%

XC1765E

XC17256E

XC1700E

Period:

Jan. 1, 1997 to Jan. 1, 1999

	XC1765E	XC17256E	XC1700E
Combined Lots:	1	3	4
Failures:	0	1	1
Device on test:	76	290	366
Actual device hours:	152,684	523,291	675,975
Mean :	2,009	1,804	1,847
Equivalent device hours @ Tj=125C:	342,719	1,174,594	1,517,313
Equivalent device hours @ Tj=70C:	5,147,960	17,643,505	22,791,464
Equivalent device hours @ Tj=25C:	9.94E+07	3.41E+08	4.40E+08

Failure Analysis:

F/A98133(1)-FANC

Failure Rate (60% C.L.) in FITS @ Tj=70C:	8.89
Failure Rate (60% C.L.) in FITS @ Tj=55C:	3.63
Failure Rate (60% C.L.) in FITS @ Tj=25C:	0.46



Reliability Testing Summary

High Temperature Life Test Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC1700E Microcircuit Group
Package Type: PD8
Actual Temperature: 145C +8C/-0C
Actual Voltage: 5.7V +/-0.25
Assumed Activation Energy: 0.58 ev @ C.L. = 60%

	XC17S05	XC17S30	XC17S40	XC17SXX
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Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Lots:	1	3	2	6
Failures:	0	1	1	2
Device on test:	76	290	152	518
Actual device hours:	152,684	523,291	157,017	832,992
Mean :	2,009	1,804	1,033	1,608
Equivalent device hours @ Tj=125C:	342,719	1,174,594	352,445	1,869,758
Equivalent device hours @ Tj=70C:	5,147,960	17,643,505	5,294,053	28,085,517
Equivalent device hours @ Tj=25C:	9.94E+07	3.41E+08	1.02E+08	5.42E+08

Failure Analysis:

F/A98133(1)-FANC

F/A98117(1)-FANC

Failure Rate (60% C.L.) in FITS @ Tj=70C:	22.17
Failure Rate (60% C.L.) in FITS @ Tj=55C:	9.05
Failure Rate (60% C.L.) in FITS @ Tj=25C:	1.15



Reliability Testing Summary High Temperature Operating Life Qualification & Monitor

Technology: Si Gate CMOS
Device Type: XC9500 Microcircuit Group
Package Type: PLCC-44 & 84 & PQFP-160, 208
Actual Temperature: 145C +8C/-0C
Actual Voltage: 5.7V +/-0.25
Assumed Activation Energy: 0.7 ev @ C.L. = 60%

XC95108 XC95144 XC9536 XC9572 XC95216 XC9500

Period: Jan. 1, 1997 to Jan. 1, 1999

	6	1	4	5	1	17
Combined Lots:	6	1	4	5	1	17
Failures:	2	0	1	0	0	3
Device on test:	432	76	286	322	78	1,194
Actual device hours:	510,210	76,152	523,630	496,746	88,374	1,695,112
Mean :	1,181	1,002	1,831	1,543	1,133	1,420
Equivalent device hours @ Tj=125C:	1,353,768	202,058	1,389,376	1,318,043	234,488	4,497,733
Equivalent device hours @ Tj=70C:	35,620,148	5,316,528	36,557,061	34,680,163	6,169,803	118,343,702
Equivalent device hours @ Tj=25C:	1.27E+09	1.89E+08	1.30E+09	1.24E+09	2.20E+08	4.21E+09

Failure Analysis: F/A98014(2)-ASL

F/A97124(1)-FANC

Failure Rate (60% C.L.) in FITS @ Tj=70C:	10.61
Failure Rate (60% C.L.) in FITS @ Tj=55C:	3.60
Failure Rate (60% C.L.) in FITS @ Tj=25C:	0.3



Reliability Testing Summary-Packages Bias Moisture Life Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC1700D, XC1701/L, XC17SXX, XC9500,
Package Type: Various
Test Condition: T=85C, R.H.=85%
Bias Voltages: 5.0V +/- .25V

	XC1700D	XC1701/L	XC17SXX	XC9500
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Period:	Jan. 1, 1997 to Jan. 1, 1999			
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Combined Started Lot:	3	1	1	4
Combined Completed Lots:	3	1	1	4
Failures:	0	0	0	0
Device on test:	135	76	76	303
Mean Test Hour s/Device:	1,016	1,000	1,000	1,054
Total Device Hours:	137,160	76,000	76,000	319,279



Reliability Testing Summary-Packages Bias Moisture Life Qualification & Monitor Combined

Technology: Si Gate CMOS
 Device Type: XC1700D Microcircuit Group
 Package Type: PD8, SOIC-8, VO-8
 Test Condition: T = 85C, R.H. = 85%
 Bias Voltages: 5.0V +/- .25V

	XC1736D	XC1765D	XC17256D	XC1700D
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Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	1	1	1	3
Combined Completed Lots:	1	1	1	3
Failures:	0	0	0	0
Device on test:	45	45	45	135
Mean Test Hour s/Device:	1,000	1,046	1,002	1,016
Total Device Hours:	45,000	47,070	45,090	137,160



Reliability Testing Summary-Packages

Bias Moisture Life

Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC1700/L Microcircuit Group
Package Type: SOIC-20
Test Condition: T = 85C, R.H. = 85%
Bias Voltages: 5.0V +/- .25V

XC1701L

XC1700/L

	XC1701L	XC1700/L
Period:	Jan. 1, 1997 to Jan. 1, 1999	
Combined Started Lot:	1	1
Combined Completed Lots:	1	1
Failures:	0	0
Device on test:	76	76
Mean Test Hour s/Device:	1,000	1,000
Total Device Hours:	76,000	76,000



Reliability Testing Summary-Packages Bias Moisture Life Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC17SXX Microcircuit Group
Package Type: SOIC-20
Test Condition: T = 85C, R.H. = 85%
Bias Voltages: 5.0V +/- .25V

XC17S40

XC17SXX

	XC17S40	XC17SXX
Period:	Jan. 1, 1997 to Jan. 1, 1999	
Combined Started Lot:	1	1
Combined Completed Lots:	1	1
Failures:	0	0
Device on test:	76	76
Mean Test Hour s/Device:	1,000	1,000
Total Device Hours:	76,000	76,000



Reliability Testing Summary-Packages Bias Moisture Life Qualification & Monitor Combined

Technology: Si Gate CMOS
 Device Type: XC9500 Microcircuit Group
 Package Type: PQFP-160, VQFP-44, CS-48, 144
 Test Condition: T = 85C, R.H. = 85%
 Bias Voltages: 5.0V +/- .25V

XC95144

XC9536

XC95000



Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	2	2	4
Combined Completed Lots:	2	2	4
Failures:	0	0	0
Device on test:	151	152	303
Mean Test Hour s/Device:	1,068	1,040	1,054
Total Device Hours:	161,275	158,004	319,279
Failure Analysis Number:			



Reliability Testing Summary-Packages Pressure Pot Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC1700D, XC1700L, XC17XXE, XC17SXX, XC7000, XC9500
Package Type: Various
Test Condition: T=121C; 2 atm. sat. steam

XC1700D XC1700L XC17XXE XC17SXX XC7000 XC9500



Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	3	1	1	2	1	3
Combined Completed Lots:	3	1	1	2	1	3
Failures:	0	0	0	0	0	0
Device on test:	135	76	45	121	27	224
Mean Test Hour s/Device:	96	168	96	141	96	96
Total Device Hours:	12,960	12,768	4,320	17,088	2,592	21,504



Reliability Testing Summary-Packages Pressure Pot Qualification & Monitor Combined

Technology: Si Gate CMOS
 Device Type: XC1700D Microcircuit Group
 Package Type: PD-8, SOIC-8, VOIC-8
 Test Condition: T = 121C; 2 atm. sat. steam

	XC1736D	XC1765D	XC17256D	XC1700D
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Period:	Jan. 1, 1997 to Jan. 1, 1999			
Combined Started Lot:	1	1	1	3
Combined Completed Lots:	1	1	1	3
Failures:	0	0	0	0
Device on test:	45	45	45	135
Mean Test Hour s/Device:	96	96	96	96
Total Device Hours:	4,320	4,320	4,320	12,960
Failure Analysis Number:				



Reliability Testing Summary-Packages Pressure Pot Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC1700/L Microcircuit Group
Package Type: SOIC-20
Test Condition: T = 121C; 2 atm. sat. steam

XC1701L

XC1700L

	XC1701L	XC1700L
Period:	Jan. 1, 1997 to Jan. 1, 1999	
Combined Started Lot:	1	1
Combined Completed Lots:	1	1
Failures:	0	0
Device on test:	76	76
Mean Test Hour s/Device:	168	168
Total Device Hours:	12,768	12,768
Failure Analysis Number:		



Reliability Testing Summary-Packages Pressure Pot Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC1700E Microcircuit Group
Package Type: PLCC-20
Test Condition: T = 121C; 2 atm. sat. steam

XC17256E

XC1700E

Period:	Jan. 1, 1997 to Jan. 1, 1999	
Combined Started Lot:	1	1
Combined Completed Lots:	1	1
Failures:	0	0
Device on test:	45	45
Mean Test Hour s/Device:	96	96
Total Device Hours:	4,320	4,320
Failure Analysis Number:		



Reliability Testing Summary-Packages Pressure Pot Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC17SXX Microcircuit Group
Package Type: SOIC-20, PLCC-20
Test Condition: T = 121C; 2 atm. sat. steam

XC17S20

XC17S40

XC17SXX

	XC17S20	XC17S40	XC17SXX
Period:	Jan. 1, 1997 to Jan. 1, 1999		
Combined Started Lot:	1	1	2
Combined Completed Lots:	1	1	2
Failures:	0	0	0
Device on test:	45	76	121
Mean Test Hour s/Device:	96	168	141
Total Device Hours:	4,320	12,768	17,088
Failure Analysis Number:			



Reliability Testing Summary-Packages Pressure Pot Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC7300 Microcircuit Group
Package Type: PQFP-100
Test Condition: T = 121C; 2 atm. sat. steam

XC73108

XC7000



Period:	Jan. 1, 1997 to Jan. 1, 1999	
Combined Started Lot:	1	1
Combined Completed Lots:	1	1
Failures:	0	0
Device on test:	27	27
Mean Test Hour s/Device:	96	96
Total Device Hours:	2,592	2,592
Failure Analysis Number:		



Reliability Testing Summary-Packages Pressure Pot Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC9500 Microcircuit Group
Package Type: PLCC-44, CS-48
Test Condition: T = 121C; 2 atm. sat. steam

XC9536

XC9572

XC9500



Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	1	2	3
Combined Completed Lots:	1	2	3
Failures:	0	0	0
Device on test:	72	152	224
Mean Test Hour s/Device:	96	96	96
Total Device Hours:	6,912	14,592	21,504
Failure Analysis Number:			



Reliability Testing Summary-Packages Temperature Cycle (Air to Air) Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC1700D, XC1700/L, XC1700E & XC17SXX,
Package Type: Various
Test Condition: T = -65C / +150C (Air to Air)
 T = -55C / +125C (Air to Air) for BGA

	XC1700D	XC1700/L	XC1700E	XC17SXX
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Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	4	4	1	2
Combined Completed Lots:	4	4	1	2
Failures:	0	1	0	0
Device on test:	211	242	45	121
Mean Test Cycles/Device:	1,009	975	1,060	924
Total Device Cycles:	212,789	235,908	47,700	111,768
Failure Analysis Number:				



Reliability Testing Summary-Packages Temperature Cycle (Air to Air) Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC7000, XC9500 & XC9500XL
Package Type: Various
Test Condition: T = -65C / +150C (Air to Air)
 T = -55C / +125C (Air to Air) for BGA

XC7000 **XC9500** **XC9500XL**

Period: **Jan. 1, 1997 to Jan. 1, 1999**

Combined Started Lot:	3	11	1
Combined Completed Lots:	3	11	1
Failures:	2	0	0
Device on test:	199	628	76
Mean Test Cycles/Device:	901	830	1,289
Total Device Cycles:	179,273	521,417	97,964
Failure Analysis Number:			



Reliability Testing Summary-Packages Temperature Cycle (Air to Air) Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC1700D Microcircuit Group
Package Type: PD-8, 20, SOIC-8, VO-8
Test Condition: T = -65C/+150C (Air to Air)

	XC1736D	XC1765D	XC17256D	XC1700D
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Period:	Jan. 1, 1997 to Jan. 1, 1999			
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Combined Started Lot:	1	1	2	4
Combined Completed Lots:	1	1	2	4
Failures:	0	0	0	0
Device on test:	45	45	121	211
Mean Test Cycles/Device:	1,000	1,009	1,011	1,009
Total Device Cycles:	45,000	45,405	122,384	212,789
Failure Analysis Number:				



Reliability Testing Summary-Packages Temperature Cycle (Air to Air) Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC1700L Microcircuit Group
Package Type: PD-8, SOIC-20, PLCC-20
Test Condition: T = -65C/+150C (Air to Air)

XC1701

XC1701L

XC1700/L

Period:

Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	3	1	4
Combined Completed Lots:	3	1	4
Failures:	1	0	1
Device on test:	166	76	242
Mean Test Cycles/Device:	1,035	843	975
Total Device Cycles:	171,840	64,068	235,908
Failure Analysis Number:	F/A98110(1)-FANC		



Reliability Testing Summary-Packages Temperature Cycle (Air to Air) Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC1700E Microcircuit Group
Package Type: PLCC-20
Test Condition: T = -65C/+150C (Air to Air)

XC17256E

XC1700E

Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	1	1
Combined Completed Lots:	1	1
Failures:	0	0
Device on test:	45	45
Mean Test Cycles/Device:	1,060	1,060
Total Device Cycles:	47,700	47,700
Failure Analysis Number:		



Reliability Testing Summary-Packages Temperature Cycle (Air to Air) Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC17SXX Microcircuit Group
Package Type: SOIC-20, PLCC-20
Test Condition: T = -65C/+150C (Air to Air)

XC17S30

XC17S40

XC17SXX

Period:

Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	1	1	2
Combined Completed Lots:	1	1	2
Failures:	0	0	0
Device on test:	45	76	121
Mean Test Cycles/Device:	1,060	843	924
Total Device Cycles:	47,700	64,068	111,768
Failure Analysis Number:			



Reliability Testing Summary-Packages Temperature Cycle (Air to Air) Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC7000 Microcircuit Group
Package Type: PQFP-100, WC-68
Test Condition: T = -65C/+150C (Air to Air)

XC7354

XC73108

XC7000

Period:	Jan. 1, 1997 to Jan. 1, 1999		
Combined Started Lot:	2	1	3
Combined Completed Lots:	2	1	3
Failures:	0	0	0
Device on test:	154	45	199
Mean Test Cycles/Device:	859	1,043	901
Total Device Cycles:	132,338	46,935	179,273
Failure Analysis Number:			



Reliability Testing Summary-Packages Temperature Cycle (Air to Air) Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC9500 Microcircuit Group
Package Type: PQFP-160, PLCC-44, 84, CS-144
Test Condition: T = -65C/+150C (Air to Air)
 T = -55C / +125C (Air to Air) for CS*

XC95108 XC95216 XC9572 XC95144 XC95144* XC9500

Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	2	1	6	1	1	11
Combined Completed Lots:	2	1	6	1	1	11
Failures:	0	0	0	0	0	0
Device on test:	152	45	282	73	76	628
Mean Test Cycles/Device:	634	328	896	1,105	1,011	830
Total Device Cycles:	96,388	14,760	252,768	80,665	76,836	521,417
Failure Analysis Number:						



Reliability Testing Summary-Packages Temperature Cycle (Air to Air) Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC9500 Microcircuit Group
Package Type: PQFP-160
Test Condition: T = -65C/+150C (Air to Air)

XC95144XL

XC9500XL

Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	1	1
Combined Completed Lots:	1	1
Failures:	0	0
Device on test:	76	76
Mean Test Cycles/Device:	1,289	1,289
Total Device Cycles:	97,964	97,964
Failure Analysis Number:		



Reliability Testing Summary-Packages Hast Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC1700E, XCS17XX, XC9500 Microcircuit Group
Package Type: Various
Test Condition: T = 130C, R.H. = 85%, 2ATM
Bias Voltage: 5.0V +/- .25V

XC1700E

XCS17XX

XC9500

Period:

Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	1	1	2
Combined Completed Lots:	1	1	2
Failures:	0	0	0
Device on test:	35	35	39
Mean Test Hours/Device:	500	500	254
Total Device Hours:	17,500	17,500	9,900



Reliability Testing Summary-Packages Hast Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC1700E Microcircuit Group
Package Type: PLCC-20
Test Condition: T = 130C, R.H. = 85%, 2ATM
Bias Voltage: 5.0V +/- .25V

XC17256E

XC1700E



Period:	Jan. 1, 1997 to Jan. 1, 1999	
Combined Started Lot:	1	1
Combined Completed Lots:	1	1
Failures:	0	0
Device on test:	35	35
Mean Test Hours/Device:	500	500
Total Device Hours:	17,500	17,500



Reliability Testing Summary-Packages Hast Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XCS17XX Microcircuit Group
Package Type: PLCC-20
Test Condition: T = 130C, R.H. = 85%, 2ATM
Bias Voltage: 5.0V +/- .25V

XC17S30

XCS17XX

Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	1	1
Combined Completed Lots:	1	1
Failures:	0	0
Device on test:	35	35
Mean Test Hours/Device:	500	500
Total Device Hours:	17,500	17,500



Reliability Testing Summary-Packages Hast Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC95108, XC9572
Package Type: PQFP-160, PLCC-44
Test Condition: T = 130C, R.H. = 85%, 2ATM
Bias Voltage: 5.0V +/- .25V

XC95108

XC9572

XC9500

Period:

Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	1	1	2
Combined Completed Lots:	1	1	2
Failures:	0	0	0
Device on test:	15	24	39
Mean Test Hours/Device:	500	100	254
Total Device Hours:	7,500	2,400	9,900



Reliability Testing Summary-Packages Data Retention Qualification & Monitor Combined

Technology: Si Gate CMOS
 Device Type: XC1700D, XC1700E, XC1700/L, XC17SXX, XC7300,
 XC9500 Microcircuit Group
 Package Type: Various
 Test Condition: 150C

	XC1700D	XC1700E	XC1700/L	XC17SXX	XC7300	XC9500
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Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	3	4	1	5	1	5
Combined Completed Lots:	3	4	1	5	1	5
Failures:	0	0	0	0	0	1
Device on test:	429	437	22	459	23	556
Mean Test Hours/Device:	2,091	2,067	2,006	2,064	1,477	1,804
Total Device Hours:	897,182	903,430	44,132	947,562	33,971	1,003,394
Failure Analysis Number:						



Reliability Testing Summary-Packages Data Retention Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC1700D Microcircuit Group
Package Type: PD-8
Test Condition: 150C

XC1736D

XC1765D

XC1700D

Period:

Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	1	2	3
Combined Completed Lots:	1	2	3
Failures:	0	0	0
Device on test:	143	286	429
Mean Test Hours/Device:	2,133	2,071	2,091
Total Device Hours:	305,019	592,163	897,182
Failure Analysis Number:			



Reliability Testing Summary-Packages Data Retention Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC1700E Microcircuit Group
Package Type: PD-8
Test Condition: 150C

XC1765E

XC17256E

XC1700E

Period:

Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	1	3	4
Combined Completed Lots:	1	3	4
Failures:	0	0	0
Device on test:	76	361	437
Mean Test Hours/Device:	2,006	2,080	2,067
Total Device Hours:	152,456	750,974	903,430



Reliability Testing Summary-Packages Data Retention Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC1700/L Microcircuit Group
Package Type: PD-8
Test Condition: 150C

XC1701L

XC1700/L

Period:

Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	1	1
Combined Completed Lots:	1	1
Failures:	0	0
Device on test:	22	22
Mean Test Hours/Device:	2,006	2,006
Total Device Hours:	44,132	44,132



Reliability Testing Summary-Packages Data Retention Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC17SXX Microcircuit Group
Package Type: PD-8
Test Condition: 150C

	XC17S05	XC17S30	XC17S40	XC17SXX
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Period:	Jan. 1, 1997 to Jan. 1, 1999			
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Combined Started Lot:	1	3	1	5
Combined Completed Lots:	1	3	1	5
Failures:	0	0	0	0
Device on test:	76	361	22	459
Mean Test Hours/Device:	2,006	2,080	2,006	2,064
Total Device Hours:	152,456	750,974	44,132	947,562



Reliability Testing Summary-Packages Data Retention Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC7300 Microcircuit Group
Package Type: PLCC-68
Test Condition: 150C

XC7354

XC7300

Period:	Jan. 1, 1997 to Jan. 1, 1999	
Combined Started Lot:	1	1
Combined Completed Lots:	1	1
Failures:	0	0
Device on test:	23	23
Mean Test Hours/Device:	1,477	1,477
Total Device Hours:	33,971	33,971
Failure Analysis Number:		



Reliability Testing Summary-Packages Data Retention Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC9500 Microcircuit Group
Package Type: PLCC- 84, PQFP-160
Test Condition: 150C

	XC95108	XC95216	XC9572	XC9500
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Period:	Jan. 1, 1997 to Jan. 1, 1999			
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Combined Started Lot:	2	1	2	5
Combined Completed Lots:	2	1	2	5
Failures:	0	0	1	1
Device on test:	214	130	212	556
Mean Test Hours/Device:	2,547	1,031	1,530	1,804
Total Device Hours:	545,058	134,030	324,306	1,003,394

Failure Analysis Number:

F/A97111(1)-FANC



Reliability Testing Summary-Packages

Erase Cycling

Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC9500 Microcircuit Group
Package Type: PLCC- 84
Test Condition: 55C
Voltage: Vcc=5.0V, Vpp=12.0-12.5V

XC9536

XC95108

XC9500

Period:

Jan. 1, 1997 to Jan. 1, 1999

	XC9536	XC95108	XC9500
Combined Started Lot:	1	1	2
Combined Completed Lots:	1	1	2
Failures:	0	0	0
Device on test:	29	80	109
Mean Test Cycles/Device:	10,000	10,939	10,689
Total Device Cycles:	290,000	875,120	1,165,120



The HARDWIRE Products

Reliability Testing Summary

High Temperature Life Test Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XHA300, XC3300 Microcircuit Group
Package Type: Various
Actual Temperature: 145C +8C/-0C
Actual Voltage: 5.7V +/-0.25
Assumed Activation Energy: 0.7 ev @ C.L. = 60%

XHA312

XC3300

Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Lots:	1	2
Failures:	0	0
Device on test:	129	130
Actual device hours:	129,050	93,796
Mean :	1,000	722
Equivalent device hours @ Tj=125C:	342,415	248,874
Equivalent device hours @ Tj=70C:	9,009,584	6,548,338
Equivalent device hours @ Tj=25C:	3.21E+08	2.33E+08
Failure Rate (60% C.L.) in FITS @ Tj=70C:	10.2	14.03
Failure Rate (60% C.L.) in FITS @ Tj=55C:	3.46	4.76
Failure Rate (60% C.L.) in FITS @ Tj=25C:	0.25	0.39

Failure Analysis:



Reliability Testing Summary

High Temperature Life Test

Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XHA300 Microcircuit Group
Package Type: PG- 299
Actual Temperature: 145C +8C/-0C
Actual Voltage: 5.7V +/-0.25
Assumed Activation Energy: 0.7 ev @ C.L. = 60%

XHA312

Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Lots:	1
Failures:	0
Device on test:	129
Actual device hours:	129,050
Mean :	1,000
Equivalent device hours @ Tj=125C:	342,415
Equivalent device hours @ Tj=70C:	9,009,584
Equivalent device hours @ Tj=25C:	3.21E+08
Failure Rate (60% C.L.) in FITS @ Tj=70C:	10.2
Failure Rate (60% C.L.) in FITS @ Tj=55C:	3.46
Failure Rate (60% C.L.) in FITS @ Tj=25C:	0.25

Failure Analysis:



Reliability Testing Summary

High Temperature Life Test Qualification & Monitor Combined

Technology: Si Gate CMOS
 Device Type: XC3300 Microcircuit Group
 Package Type: PLCC-84, PQFP-100
 Actual Temperature: 145C +8C/-0C
 Actual Voltage: 5.7V +/-0.25
 Assumed Activation Energy: 0.7 ev @ C.L. = 60%

XC3342

XC3390

XC3300

Period: Jan. 1, 1997 to Jan. 1, 1999

	XC3342	XC3390	XC3300
Combined Lots:	1	1	2
Failures:	0	0	0
Device on test:	54	76	130
Actual device hours:	55,188	38,608	93,796
Mean :	1,022	508	722
Equivalent device hours @ Tj=125C:	146,433	102,441	248,874
Equivalent device hours @ Tj=70C:	3,852,933	2,695,405	6,548,338
Equivalent device hours @ Tj=25C:	1.37E+08	9.60E+07	2.33E+08

Failure Analysis:

Failure Rate (60% C.L.) in FITS @ Tj=70C:	14.03
Failure Rate (60% C.L.) in FITS @ Tj=55C:	4.76
Failure Rate (60% C.L.) in FITS @ Tj=25C:	0.39



Reliability Testing Summary-Packages Bias Moisture Life Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC3300, XC4300 Microcircuit Group
Package Type: Various
Test Condition: T = 85C, R.H. = 85%
Bias Voltages: 5.0V +/- .25V

XC3300

XC4300



Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	1	2
Combined Completed Lots:	1	2
Failures:	0	0
Device on test:	78	149
Mean Test Hour s/Device:	1,124	1,007
Total Device Hours:	87,672	149,973
Failure Analysis Number:		



Reliability Testing Summary-Packages Bias Moisture Life Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC3300 Microcircuit Group
Package Type: TQFP-176
Test Condition: T = 85C, R.H. = 85%
Bias Voltages: 5.0V +/- .25V

XC3390

XC3300



Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	1	1
Combined Completed Lots:	1	1
Failures:	0	0
Device on test:	78	78
Mean Test Hour s/Device:	1,124	1,124
Total Device Hours:	87,672	87,672
Failure Analysis Number:		



Reliability Testing Summary-Packages Bias Moisture Life Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4300 Microcircuit Group
Package Type: PQFP-208
Test Condition: T = 85C, R.H. = 85%
Bias Voltages: 5.0V +/- .25V

XC4310

XC4300



Period: Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	2	2
Combined Completed Lots:	2	2
Failures:	0	0
Device on test:	149	149
Mean Test Hour s/Device:	1,007	1,007
Total Device Hours:	149,973	149,973
Failure Analysis Number:		



Reliability Testing Summary-Packages Pressure Pot Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC0300, XC4300 Microcircuit Group
Package Type: Various
Test Condition: T = 121C; 2 atm. sat. steam

XC3300

XC4300

XC4400

Period:

Jan. 1, 1997 to Jan. 1, 1999

	XC3300	XC4300	XC4400
Combined Started Lot:	2	1	1
Combined Completed Lots:	2	1	1
Failures:	0	0	0
Device on test:	154	78	75
Mean Test Cycles/Device:	166	168	168
Total Device Cycles:	25,568	13,104	12,600



Reliability Testing Summary-Packages Pressure Pot Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC3300 Microcircuit Group
Package Type: TQFP-176, PQFP-100
Test Condition: T = 121C; 2 atm. sat. steam

XC3342

XC3390A

XC3300

	XC3342	XC3390A	XC3300
Period:	Jan. 1, 1997 to Jan. 1, 1999		
Combined Started Lot:	1	1	2
Combined Completed Lots:	1	1	2
Failures:	0	0	0
Device on test:	76	78	154
Mean Test Cycles/Device:	164	168	166
Total Device Cycles:	12,464	13,104	25,568



Reliability Testing Summary-Packages Pressure Pot Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4300/XC4400 Microcircuit Group
Package Type: PQFP-208
Test Condition: T = 121C; 2 atm. sat. steam

XC4310

XC4300

Period:

Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	1	1
Combined Completed Lots:	1	1
Failures:	0	0
Device on test:	78	78
Mean Test Cycles/Device:	168	168
Total Device Cycles:	13,104	13,104



Reliability Testing Summary-Packages Pressure Pot Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4300/XC4400 Microcircuit Group
Package Type: PQFP-240
Test Condition: T = 121C; 2 atm. sat. steam

XC4413

XC4400

Period:	Jan. 1, 1997 to Jan. 1, 1999	
Combined Started Lot:	1	1
Combined Completed Lots:	1	1
Failures:	0	0
Device on test:	75	75
Mean Test Cycles/Device:	168	168
Total Device Cycles:	12,600	12,600



Reliability Testing Summary-Packages Temperature Cycle (Air to Air) Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC3300, XC4300 & XC4400 Microcircuit Group
Package Type: Various
Test Condition: T = -65C/+150C (Air to Air)

	XC3300	XC4300	XC4400
Period:	Jan. 1, 1997 to Jan. 1, 1999		
Combined Started Lot:	1	4	1
Combined Completed Lots:	1	4	1
Failures:	0	0	0
Device on test:	78	308	76
Mean Test Cycles/Device:	1,153	1,017	1,151
Total Device Cycles:	89,934	313,206	87,476



Reliability Testing Summary-Packages Temperature Cycle (Air to Air) Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC3300 Microcircuit Group
Package Type: TQFP-176
Test Condition: T = -65C/+150C (Air to Air)

XC3390A

XC3300

Period:	Jan. 1, 1997 to Jan. 1, 1999	
Combined Started Lot:	1	1
Combined Completed Lots:	1	1
Failures:	0	0
Device on test:	78	78
Mean Test Cycles/Device:	1,153	1,153
Total Device Cycles:	89,934	89,934



Reliability Testing Summary-Packages Temperature Cycle (Air to Air) Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4300 Microcircuit Group
Package Type: PQFP-100,160,208
Test Condition: T = -65C/+150C (Air to Air)

	XC4303	XC4305	XC4310	XC4300
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Period:	Jan. 1, 1997 to Jan. 1, 1999
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Combined Started Lot:	1	1	2	4
Combined Completed Lots:	1	1	2	4
Failures:	0	0	0	0
Device on test:	76	76	156	308
Mean Test Cycles/Device:	1,005	1,005	1,029	1,017
Total Device Cycles:	76,380	76,380	160,446	313,206



Reliability Testing Summary-Packages Temperature Cycle (Air to Air) Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC4400 Microcircuit Group
Package Type: PQFP-240
Test Condition: T = -65C/+150C (Air to Air)

XC4413

XC4400

Period:	Jan. 1, 1997 to Jan. 1, 1999	
Combined Started Lot:	1	1
Combined Completed Lots:	1	1
Failures:	0	0
Device on test:	76	76
Mean Test Cycles/Device:	1,151	1,151
Total Device Cycles:	87,476	87,476



Reliability Testing Summary-Packages Hast Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC2300 & XC3300 Microcircuit Group
Package Type: Various
Test Condition: T = 130C, R.H. = 85%, 2ATM
Bias Voltage: 5.0V +/- .25V

XC2300

XC3300

Period:

Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	1	1
Combined Completed Lots:	1	1
Failures:	0	0
Device on test:	22	24
Mean Test Hours/Device:	100	500
Total Device Hours:	2,200	12,000



Reliability Testing Summary-Packages Hast Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC2318
Package Type: PLCC-44
Test Condition: T = 130C, R.H. = 85%, 2ATM
Bias Voltage: 5.0V +/- .25V

XC2318

XC2300

Period:

Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	1	1
Combined Completed Lots:	1	1
Failures:	0	0
Device on test:	22	22
Mean Test Hours/Device:	100	100
Total Device Hours:	2,200	2,200



Reliability Testing Summary-Packages Hast Qualification & Monitor Combined

Technology: Si Gate CMOS
Device Type: XC3390
Package Type: PLCC-84
Test Condition: T = 130C, R.H. = 85%, 2ATM
Bias Voltage: 5.0V +/- .25V

XC3390

XC3300

Period:

Jan. 1, 1997 to Jan. 1, 1999

Combined Started Lot:	1	1
Combined Completed Lots:	1	1
Failures:	0	0
Device on test:	24	24
Mean Test Hours/Device:	500	500
Total Device Hours:	12,000	12,000



Package Qualification & Monitor Program



Reliability Testing Summary Package Qualification / Monitor PD-8

Device Type: XC1736D, XC1701
Package Type: PD8
Die Attach Material: Silver Epoxy
Molding Compound: Sumitomo 6300H & Shenitsu KMC-1805

Reliability Test	Combined No. Lots	Failures	Device On Test	Mean Test Hrs/Cycles	Total Device Hrs
T/C	2	1*	120	1,026	123,150
Pressure Pot	1	0	45	96	4,320
Solderability	1	0	5	*F/A98110(1)-FANC	
Resistance to Solvents	1	0	3		
Lead Fatigue	1	0	6		
Physical Dimension	1	0	3		

Period: Jan. 1st, 1997 to Jan. 1st, 1999



Reliability Testing Summary

Package Qualification / Monitor

SOIC

Device Type: XC1701/L, XC1765D
Package Type: SOIC-8, SOIC-20
Die Attach Material: Silver Epoxy
Molding Compound: EME6300H

Reliability Test	Combined No.Lots	Failures	Device On Test	Mean Test Hrs/Cycles	Total Device Hrs
T/C	3	0	136	915	124,503
Pressure Pot	2	0	121	141	17,088
Solderability	1	0	3		
Lead Fatigue	2	0	8		
Physical Dimension	2	0	10		
Resistance to Solvents	1	0	3		
Bond Pull	1	0	3		
Adhesion to lead finish	1	0	3		
Die shear	1	0	3		

Period: Jan. 1st, 1997 to Jan. 1st, 1999



Reliability Testing Summary Package Qualification / Monitor VO8

Device Type: XC17256D
Package Type: VO8
Die Attach Material: Silver Epoxy
Molding Compound: EME6300H

Reliability Test	Combined No.Lots	Failures	Device On Test	Mean Test Hrs/Cycles	Total Device Hrs
T/C	1	0	45	1,024	46,080
Pressure Pot	1	0	45	96	4,320
Solderability	1	0	3		
Lead Fatigue	1	0	5		
Physical Dimension	1	0	5		
Resistance to	1	0	3		

Period: Jan. 1st, 1997 to Jan. 1st, 1999



Reliability Testing Summary

Package Qualification / Monitor

TSOP

Device Type: XC17256D
Package Type: VO8
Die Attach Material: Silver Epoxy
Molding Compound: KMC 184-4

Reliability Test	Combined No.Lots	Failures	Device On Test	Mean Test Hrs/Cycles	Total Device Hrs
T/C	1	0	45	1,024	46,080
Pressure Pot	1	0	45	96	4,320
Solderability	1	0	3		
Physical Dimension	1	0	5		
Resistance to Solvents	1	0	3		
Lead Fatigue	1	0	5		

Period: Jan. 1st, 1997 to Jan. 1st, 1999



Reliability Testing Summary

Package Qualification / Monitor

PLCC

Device Type: XC3030/A, XC3042, XC3195/A, XC3390
 XC4005E, XC4010, XC5202, XC2318, XC7354
 XC95108, XC9572, XC1701, XC17256D, XC17256E

Package Type: PLCC- 84

Die Attach Material: Silver Epoxy

Molding Compound: Sumitomo 6300H, MP8000

Reliability Test	Combined No. Lots	Failures	Device On Test	Mean Test Hrs/Cycles	Total Device Hrs
T/C	22	0	1,237	936	1,157,901
Pressure Pot	12	0	641	113	72,624
Hast	8	0	193	234	45,100
Solderability	2	0	6		
Resistance to Solvents	4	0	12		
Lead Fatigue	2	0	6		
Physical Dimension	3	0	15		
Bond Pull	2	0	10		
Die Shear	1	0	5		

Period: Jan. 1st, 1997 to Jan. 1st, 1999



Reliability Testing Summary Package Qualification / Monitor

PQFP

Device Type: XC3042/A, XC3090/A XC95108, XC95144, XC95144XL, XC95108
XC4020XL, XC4005, XC4006, XC4303, XC4305, XC4310,
XC3342, XC4413, XC4008, XC4013/E, XC4025E, XC5206,
XCS40, XC73108

Package Type: PQFP- 100, 160, 208 & 240

Die Attach Material: Silver Epoxy

Molding Compound: Sumitomo 6300H, EME-7304LC, E7N36 & MP8000

Reliability Test	Combined No. Lots	Failures	Device On Test	Mean Test Hrs/Cycles	Total Device Hrs
T/C	28	2*	1,702	998	1,698,113
Pressure Pot	16	2**	855	124	105,894
Hast	8	0	98	208	20,400
Adhesion to Lead Finish	1	0	3	** FA98043(2)-MST * FA97098(2)-FANC	
Solderability	6	0	18		
Resistance to Solvents	5	0	15		
Bond Pull	2	0	10		
Lead Fatigue	5	0	15		
Physical Dimension	5	0	25		
Die shear	1	0	5		

Period: Jan. 1st, 1997 to Jan. 1st, 1999



Reliability Testing Summary Package Qualification / Monitor TQFP

Device Type: XC3390A, XC3190/A, XC4010L, 4005, XC4006E,
XC5204, XCS30, XC4010XL

Package Type: TQFP- 144 & 176

Die Attach Material: Silver Epoxy

Molding Compound: EME-7320, E7N32

Reliability Test	Combined No. Lots	Failures	Device On Test	Mean Test Hrs/Cycles	Total Device Hrs
T/C	8	0	407	1,112	452,614
Pressure Pot	7	0	384	139	53,352
Solderability	1	0	3		
Resistance to Solvents	1	0	3		
Lead Fatigue	1	0	3		
Physical Dimension	1	0	5		
Die shear	1	0	5		
Bond Pull	1	0	5		
Adhesion to Lead finish	1	0	3		

Period: Jan. 1st, 1997 to Jan. 1st, 1999



Reliability Testing Summary Package Qualification / Monitor VQFP

Device Type: XC3030/A, XC4003, XC4003E, XCS30
Package Type: VQFP- 100
Die Attach Material: Silver Epoxy
Molding Compound: EME-7320

Reliability Test	Combined No.Lots	Failures	Device On Test	Mean Test Hrs/Cycles	Total Device Hrs
T/C	4	0	190	1,450	275,530
Pressure Pot	3	0	167	160	26,688
Resistance to Solvents	1	0	3		
Lead Fatigue	2	0	6		
Physical Dimension	2	0	10		
Solderability	1	0	3		

Period: Jan. 1st, 1997 to Jan. 1st, 1999



Reliability Testing Summary

Package Qualification / Monitor

HQFP

Device Type: XC4005, XC4025/E, XC4013/E, XC4020E, XC5215,
XC4028EX, XC4036EX, XC4036XL, XC4062XL, XC95216
XC4085XL, XC40150XV

Package Type: HQFP-208, 240 & 304

Die Attach Material: 84-1LMSR4

Molding Compound: Sumitomo 7304L

Reliability Test	Combined No.Lots	Failures	Device On Test	Mean Test Hrs/Cycles	Total Device Hrs
T/C	22	0	822	868	713,436
Pressure Pot	12	0	532	127	67,728
Hast	5	1*	58	390	22,600
Resistance to Solvents	5	0	15	*FA97114(1)-FANC	
Lead Fatigue	6	0	18		
Physical Dimension	8	0	40		
Solderability	6	0	18		
Die shear	2	0	10		
Bond Pull	5	0	25		

Period: Jan. 1st, 1997 to Jan. 1st, 1999



Reliability Testing Summary Package Qualification / Monitor PPGA

Device Type: XC3064/A, XC3190/A
Package Type: PPGA-132, & 175
Die Attach Material: Silver Epoxy
Sealant Material: R4785

Reliability Test	Combined No.Lots	Failures	Device On Test	Mean Test Hrs/Cycles	Total Device Hrs
T/C	1	0	45	1,060	47,700
Pressure Pot	2	0	90	96	8,640
Solderability	2	0	6		
Resistance to Solvents	1	0	3		
Lead Fatigue	2	0	6		
Physical Dimension	2	0	10		
Bond Strength	1	0	5		
Die shear	1	0	5		

Period: Jan. 1st, 1997 to Jan. 1st, 1999



Reliability Testing Summary Package Qualification / Monitor HTFP

Device Type: XC3090A, XC4010, XC4020XL
Package Type: HT-176, HT-208
Die Attach Material: Silver Epoxy
Molding Compound: 7320CR

Reliability Test	Combined No.Lots	Failures	Device On Test	Mean Test Hrs/Cycles	Total Device Hrs
T/S	1	0	76	500	38,000
T/C	2	0	121	590	71,362
Pressure Pot	2	0	117	96	11,232
Resistance to Solvents	1	0	3		
Physical Dimension	1	0	5		
Lead Integrity	1	0	3		
Solderability	1	0	3		
Adhesion to lead finish	1	0	3		



Reliability Testing Summary Package Qualification / Monitor BGA

Device Type: XC4010/E, XC4013/E, XC4028EX, XC4036EX,
XC4020XL, XC4036XL, XC4062XL, XC4085XL,

Package Type: BGA-225, 352, 432 & BGA-560

Die Attach Material: Silver Epoxy

Test Condition: -55C/+125C for T/C

Reliability Test	Combined No.Lots	Failures	Device On Test	Mean Test Hrs/Cycles	Total Device Hrs
T/C	13	0	531	1,042	553,302
Pressure Pot	16	1*	635	129	81,984
Resistance to Solvents	4	0	12	*FA98003(1)-FANC	
Physical Dimension	7	0	35		
Ball Shear	7	0	28		
Bond Pull	5	0	18		
Die shear	2	0	6		
Salt Atmosphere	2	0	30		

Period: Jan. 1st, 1997 to Jan. 1st, 1999



Reliability Testing Summary Package Qualification / Monitor CS

Device Type: XC9536, XC95144
Package Type: CS-48, -144
Die Attach Material: Silver Epoxy
Test Condition: -55C/+125C for T/C

Reliability Test	Combined No.Lots	Failures	Device On Test	Mean Test Hrs/Cycles	Total Device Hrs
T/C	1	0	76	1,011	76,836
Pressure Pot	1	0	72	96	6,912
Resistance to Solvents	1	0	3		
Physical Dimension	1	0	5		
Ball Shear	1	0	5		
Bond Pull	2	0	5		

Period: Jan. 1st, 1997 to Jan. 1st, 1999



Reliability Testing Summary
PGA Package Qualification / Monitor
PGA-84, -120, -132, -156, -175, -191, -223, -299, -411, -475, -559

Code	Test	Combined Sample	Failures	Mean Hrs/Cycles Per Device	Total Device Hours
B2	Resistance to Solvents	249	0		
B3	Solderability	242	0		
B5	Bond Strength	305	0		
D1	Physical Dimension	140	0		
D2	Lead Integrity	24	0		
D3	Seal				
	Thermal Shock	150	1	FA97064-ASL	2,250
	Temperature Cycle				15,000
	Seal				
	Visual Examination				
	End-Point Elect.				
	Parametrics				
D4	Mechanical Shock	152	0		
	Vibration, Var. Freq.				
	Constant Accel.				
	Seal				
	Visual Examination				
	End-Point Elec. Para.				
D5	Salt Atmosphere	138	0		
	Seal				
	Visual Examination				
D6	Internal Water-Vapor Content	36	0		
D7	Adhesion of lead finish	27	0		

Period: Jan. 1st, 1997 to Jan. 1st, 1999



**Reliability Testing Summary
CB Package Qualification / Monitor
CB-100, -164, -196, -228**

Code	Test	Combined Sample	Failures	Mean Hrs/Cycles Per Device	Total Device Hours
B2	Resistance to Solvents	192	0		
B3	Solderability	159	0		
B5	Bond Strength	191	0		
D1	Physical Dimension	165	0		
D2	Lead Integrity	33	0		
	Seal				
D3	Thermal Shock	165	0	15	2,475
	Temperature Cycle			100	16,500
	Seal				
	Visual Examination				
	End-Point Elect.				
	Parametrics				
D4	Mechanical Shock	165	0		
	Vibration, Var. Freq.				
	Constant Accel.				
	Seal				
	Visual Examination				
	End-Point Elec. Para.				
D5	Salt Atmosphere	165	0		
	Seal				
	Visual Examination				
D6	Internal Water-Vapor Content	35	0		
D7	Adhesion of lead finish	33	0		

Period: Jan. 1st, 1997 to Jan. 1st, 1999



Reliability Testing Summary

CQFP Package Qualification / Monitor

CQFP-100

Code	Test	Combined Sample	Failures	Mean Hrs/Cycles Per Device	Total Device Hours
B2	Resistance to Solvents	18	0		
B3	Solderability	15	0		
B5	Bond Strength	16	0		
D1	Physical Dimension	30	0		
D2	Lead Integrity	6	0		
	Seal		0		
D3	Thermal Shock	30	0	15	450
	Temperature Cycle			100	3,000
	Seal				
	Visual Examination				
	End-Point Elect.				
	Parametrics				
D4	Mechanical Shock	45	4		
	Vibration, Var. Freq.				
	Constant Accel.				
	Seal				
	Visual Examination				
	End-Point Elec. Para.				
D5	Salt Atmosphere	30	0		
	Seal				
	Visual Examination				
D6	Internal Water-Vapor Content	6	0		
D7	Adhesion of lead finish	6	0		
D8	Lead Torque	8	0		

Period: Jan. 1st, 1997 to Jan. 1st, 1999



Reliability Testing Summary DD8 Package Qualification / Monitor

Code	Test	Combined Sample	Failures	Mean Hrs/Cycles Per Device	Total Device Hours
B2	Resistance to Solvents	21	0		
B3	Solderability	25	0		
B5	Bond Strength	28	0		
D1	Physical Dimension	45	0		
D2	Lead Integrity	18	0		
D3	Thermal Shock	105	1*	15	1,575
	Temperature Cycle			100	10,500
	Seal				
	Visual Examination				
	End-Point Elect.				
	Parametrics				*F/A98129(3)-FANC
D4	Mechanical Shock	105	1*		
	Vibration, Var. Freq.				
	Constant Accel.				
	Seal				
	Visual Examination				
	End-Point Elec. Para.				
D5	Salt Atmosphere	105	1*		
	Seal				
	Visual Examination				
D6	Internal Water-Vapor Content	9	0		
D7	Adhesion of lead finish	9	0		
D8	Lead Torque	15	0		

Period: Jan. 1st, 1997 to Jan. 1st, 1999



Reliability Testing Summary WC44 Package Qualification (EPLD)

Code	Test	Combined Sample	Failures
B2	Resistance to Solvents	4	0
B3	Solderability	44	0
B5	Bond Strength	45	0
D1	Physical Dimension	40	0
D2	Lead Integrity Seal	90	0
D3	Thermal Shock Temperature Cycle Seal Visual Examination End-Point Elect. Parametrics	25	0
D4	Mechanical Shock Vibration, Var. Freq. Constant Accel. Seal Visual Examination End-Point Elec. Para.	25	0
D5	Salt Atmosphere Seal Visual Examination	30	0
D6	Internal Water-Vapor Content	6	0
D7	Adhesion of lead finish	30	0
D8	Lead Torque	5	0



Reliability Testing Summary WC68 Package Qualification (EPLD)

Code	Test	Combined Sample	Failures
B3	Solderability	22	0
D1	Physical Dimension	25	0
D2	Lead Integrity	45	0
	Seal (No Leads)		
D3	Thermal Shock	26	0
	Temperature Cycle		
	Seal		
	Visual Examination		
	End-Point Elect.		
	Parametrics		
D4	Mechanical Shock	25	0
	Vibration, Var. Freq.		
	Constant Accel.		
	Seal		
	Visual Examination		
	End-Point Elec. Para.		
D8	Lead Torque	5	0



Reliability Testing Summary WC84 Package Qualification (EPLD)

Code	Test	Combined Sample	Failures
B2	Resistance to Solvents	4	0
B3	Solderability	60	0
B5	Bond Strength	30	0
D1	Physical Dimension	68	0
D2	Lead Integrity	167	0
	Seal (No Leads)		
D3	Thermal Shock	130	0
	Temperature Cycle		
	Seal		
	Visual Examination		
	End-Point Elect.		
	Parametrics		
D4	Mechanical Shock	105	1
	Vibration, Var. Freq.		
	Constant Accel.		
	Seal		
	Visual Examination		
	End-Point Elec. Para.		
D5	Salt Atmosphere	47	0
	Seal		
	Visual Examination		
D6	Internal Water-Vapor Content	10	0
D7	Adhesion of lead finish	45	0
D8	Lead Torque	10	0



Reliability Testing Summary PG84 Package Qualification (EPLD)

Code	Test	Combined Sample	Failures
B3	Solderability	22	0
D1	Physical Dimension	25	0
D2	Lead Integrity	77	0
	Seal (No Leads)		
D3	Thermal Shock	25	0
	Temperature Cycle		
	Seal		
	Visual Examination		
	End-Point Elect.		
	Parametrics		
D4	Mechanical Shock	25	0
	Vibration, Var. Freq.		
	Constant Accel.		
	Seal		
	Visual Examination		
	End-Point Elec. Para.		
D5	Salt Atmosphere	15	0
	Seal		
	Visual Examination		
D6	Internal Water-Vapor Content	5	0
D7	Adhesion of lead finish	15	0
D8	Lead Torque	6	0



Reliability Testing Summary PG144 Package Qualification (EPLD)

Code	Test	Combined Sample	Failures
B3	Solderability	22	0
B5	Bond Strength	15	0
D1	Physical Dimension	25	0
D2	Lead Integrity	45	0
	Seal (No Leads)		
D3	Thermal Shock	25	0
	Temperature Cycle		
	Seal		
	Visual Examination		
	End-Point Elect.		
	Parametrics		
D4	Mechanical Shock	24	0
	Vibration, Var. Freq.		
	Constant Accel.		
	Seal		
	Visual Examination		
	End-Point Elec. Para.		
D5	Salt Atmosphere	15	0
	Seal		
	Visual Examination		
D6	Internal Water-Vapor Content	3	0
D7	Adhesion of lead finish	15	0



Reliability Testing Summary-Packages EIAJ Temperature Soldering Heat Test

Technology:	Si-Gate CMOS
Device Type:	XC1700 Microcircuit Group
Package Type:	PD8 & PLCC20
Assembly:	Anam & AAPI
Preconditioning Test Condition:	T = 85C, R.H. = 85%
Test Duration:	240 hours
Solder Heat Temp.:	350 +/- 10 degrees C
Test Duration:	3 + 0.5/-0 seconds

XC1736A

XC17128D

XC1765

XC1700

Period:

Oct. 1, 1996 to Oct. 1, 1998

Combined Started Lot:	1	1	3	5
Combined Completed Lots:	1	1	3	5
Failures:	0	0	0	0
Device on test:	5	3	13	21
Failure Analysis:				

Note : Solderability test applied to all leads



Reliability Testing Summary-Packages EIAJ Temperature Soldering Heat Test

Technology: Si-Gate CMOS
Device Type: XC3000/A & XC3100/A Microcircuit Group
Package Type: PLCC-68, 84 & PPGA-132
Assembly: Anam
Preconditioning Test Condition: T = 85C, R.H. = 85%
Test Duration: 240 hours
Solder Heat Temp.: 350 +/- 10 degrees C
Test Duration: 3 + 0.5/-0 seconds

XC3020/A XC3030/ XC3042/A XC3142/A XC3000/A/XC3100/A

Period: Oct. 1, 1996 to Oct. 1, 1998

Combined Started Lot:	2	1	2	1	6
Combined Completed Lots:	2	1	2	1	6
Failures:	0	0	0	0	0
Device on test:	10	5	10	3	28
Failure Analysis:					

Note : Solderability test applied to all leads



Reliability Testing Summary-Packages EIAJ Temperature Soldering Test

Technology: Si-Gate CMOS
Device Type: XC1700 Microcircuit Group
Package Type: PD8C & PLCC-20
Assembly: Anam & AAPI
Preconditioning Test Condition: Steam Age
Test Duration: 1 hour min.
Solder Heat Temp.: 230 +/- 5 degrees C
Test Duration: 3 +/- 1 seconds
Rate: 1 +/- 0.1 in./sec.

XC 1736A

XC1765D

XC17128D

XC1700

Period:

Oct. 1, 1996 to Oct. 1, 1998

Combined Started Lot:	1	1	1	3
Combined Completed Lots:	1	1	1	3
Failures:	0	0	0	0
Device on test:	3	3	3	9
Failure Analysis:				

Note : Solderability test applied to the number of leads LTPD 10, 22 leads accept on 0



Reliability Testing Summary-Packages EIAJ Temperature Soldering Test

Technology: Si-Gate CMOS
Device Type: XC3000/A Microcircuit Group
Package Type: PLCC-68, 84 & PPGA-132 & PQFP-120
Assembly: Anam
Preconditioning Test Condition: Steam Age
Test Duration: 1 hour min.
Solder Heat Temp.: 230 +/- 5 degrees C
Test Duration: 3 +/-1 seconds
Rate: 1 +/- 0.1 in.sec

	XC3020/A	XC3090/A	XC3142/A	XC3000/A/XC3100/A
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Period:	Oct. 1, 1996 to Oct. 1, 1998
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Combined Started Lot:	2	1	1	4
Combined Completed Lots:	2	1	1	4
Failures:	0	0	0	0
Device on test:	6	3	3	12
Failure Analysis:				

Note : Solderability test applied to the number of leads LTPD 10, 22 leads accept on 0



Reliability Testing Summary-Packages

EIAJ Temperature Soldering Test

Technology: Si-Gate CMOS
Device Type: XC4000 Microcircuit Group
Package Type: PQFP-208 & MQFP-208
Assembly: Anam
Preconditioning Test Condition: Steam Age
Test Duration: 1 hour min.
Solder Heat Temp.: 230 +/- 5 degrees C
Test Duration: 3 +/- 1 second
Rate: 1 +/- 0.1 in./sec.

XC4008

XC4010

XC4000

Period:

Oct. 1, 1996 to Oct. 1, 1998

Combined Started Lot:	1	1	2
Combined Completed Lots:	1	1	2
Failures:	0	0	0
Device on test:	3	3	6
Failure Analysis:			

Note : Solderability test applied to the number of leads LTPD 10, 22 leads accept on 0



Reliability Testing Summary-Packages Low Temperature Soldering Heat Test

Technology: Si-Gate CMOS
Device Type: Various Microcircuits
Package Type: PQFP-100, 120, 160 ,208, MQFP-208, & PPGA-175
Steam Age: 2 hours
Flux: RMA
Solder Heat Temp.: 215 +/- 5 degrees C

	PQ100	PQ120	PQ160	PQ208	MQ208	PP175
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Period:	Oct. 1, 1996 to Oct. 1, 1998
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Combined Started Lot:	2	1	2	1	3	1
Combined Completed Lots:	2	1	2	1	3	1
Failures:	0	0	0	0	0	0
Device on test:	10	3	9	3	5	3
Failure Analysis:						

Note : Solderability test applied to the number of leads LTPD 10, 22 leads accept on 0



Reliability Testing Summary-Packages Low Temperature Soldering Heat Test

Technology:	Si-Gate CMOS
Device Type:	Various Microcircuits
Package Type:	PD-8, & PLCC-20, 84
Steam Age:	2 hours
Flux:	RMA
Solder Heat Temp.:	215 +/- 5 degrees C

PD8

PC20

PC84

Period:

Oct. 1, 1996 to Oct. 1, 1998

Combined Started Lot:	1	1	1
Combined Completed Lots:	1	1	1
Failures:	0	0	0
Device on test:	3	3	3
Failure Analysis:			

Note : Solderability test applied to the number of leads LTPD 10, 22 leads accept on 0

