PLX TECHNOLOGY QUARTERLY MONITOR REPORT

RELIABILITY TEST

Q1, 2011: Rev. 1

PROCESS TECHNOLOGY MATRIX

FOUNDRY FAB	PROCESS TECHNOLOGIES
TSMC, Taiwan	0.065, 0.09, 0.13, 0.18, 0.25, 0.35, 0.50 µm CMOS
Seiko Epson, Japan	0.35 and 0.6 µm, CMOS
Renesas, Japan	0.15, 0.25, 0.35 µm CMOS

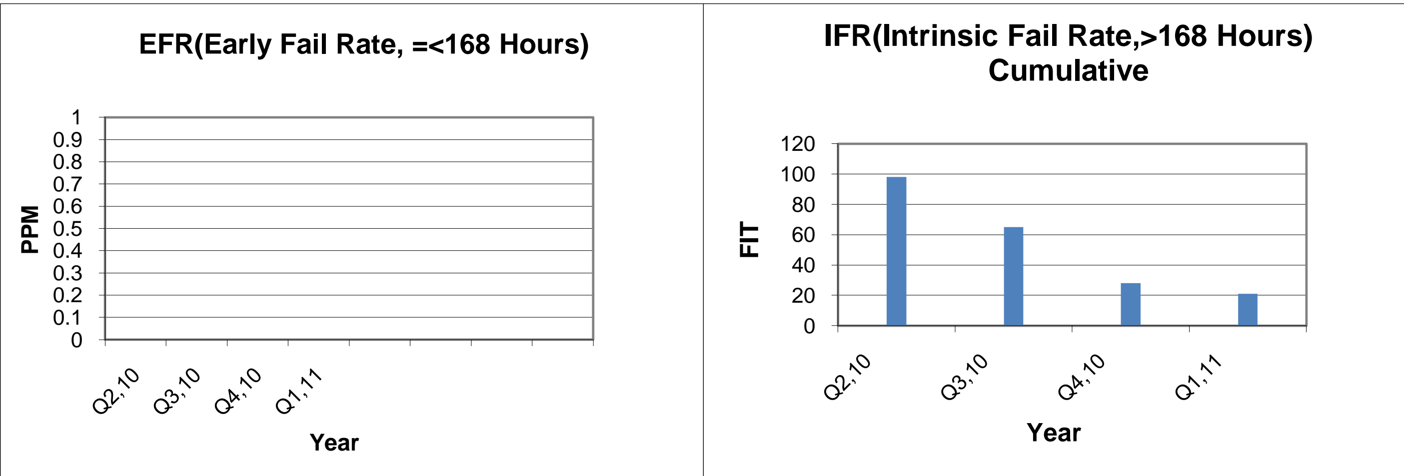
DIE RELIABILITY DATA OUTLINE
HTOL (IFR/EFR)

ASSEMBLY SUBCON	PACKAGE TECHNOLOGIES
Amkor, Taiwan	HFCBGA
ASE, Kaohsiung	EPQFP, QFN, PBGA, HSBGA, HFCBGA
ASE, Malaysia	PQFP, PBGA, HSBGA
Renesas, Japan	PQFP, PBGA, FBGA
Seiko-Epson, Japan	PQFP, PBGA
STATS ChiPAC, Korea	PBGA, HSBGA
STATS ChiPAC, Singapore	PQFP
UTAC, Singapore	PQFP, EPQFP

PACKAGE RELIABILITY DATA OUTLINE
TCT
THBT/HAST
PCT

RELIABILITY HTOL DATA @125 °C

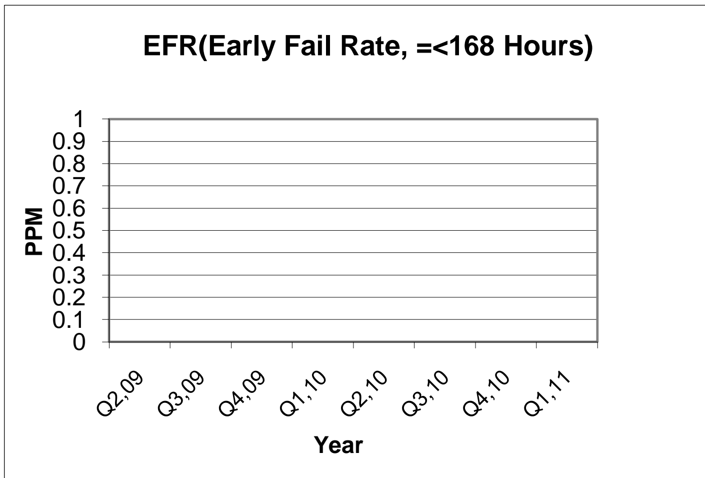
FOUNDRY: TSMC Taiwan, Process: 0.065 µm Low-K CMOS							
	EFR (Early Fail Rate,=< 168 Hours)			FITs @ 60% CL, 55C, Ea = 0.7eV			
YEAR	Sample	# Failure	PPM	Sample	Cum Dev	# Failure	FITs
Q2,10	120	0	0	120	120,000	0	98
Q3,10	1284	0	0	1284	181,632	0	65
Q4,10	2756	0	0	2756	427,968	0	28
Q1,11	120	0	0	120	547,968	0	21
Note:							

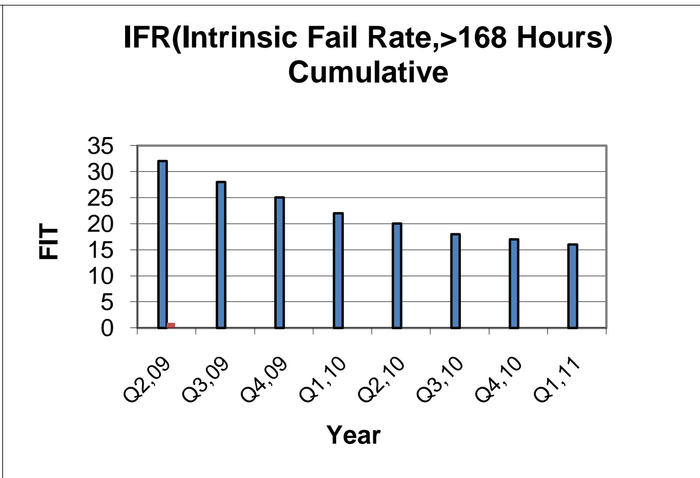


RELIABILITY HTOL DATA @125 °C

FOUNDRY: TSMC Taiwan, Process: 0.09 µm Low-K CMOS							
	EFR (Early Fail Rate,=< 168 Hours)			FITs @ 60% CL, 55C, Ea = 0.7eV			
YEAR	Sample	# Failure	PPM	Sample	Cum Dev	# Failure	FITs
Q1,08	120	0	0	120	60,000	0	196
Q2,08	120	0	0	120	210,000	0	56
Q3,08	120	0	0	120	330,000	1*	79
Q4,08	120	0	0	120	450,000	0	58
Q1,09	120	0	0	120	570,000	0	46
Q2,09	240	0	0	240	810,000	0	32
Q3,09	120	0	0	120	930,000	0	28
Q4,09	120	0	0	120	1,050,000	0	25
Q1,10	120	0	0	120	1,170,000	0	22
Q2,10	120	0	0	120	1,290,000	0	20
Q3,10	120	0	0	120	1,410,000	0	18
Q4,10	120	0	0	120	1,530,000	0	17
Q1,11	120	0	0	120	1,650,000	0	16

Note:
***=1 unit damaged during failure analysis, root cause could not be determined, random failure.**

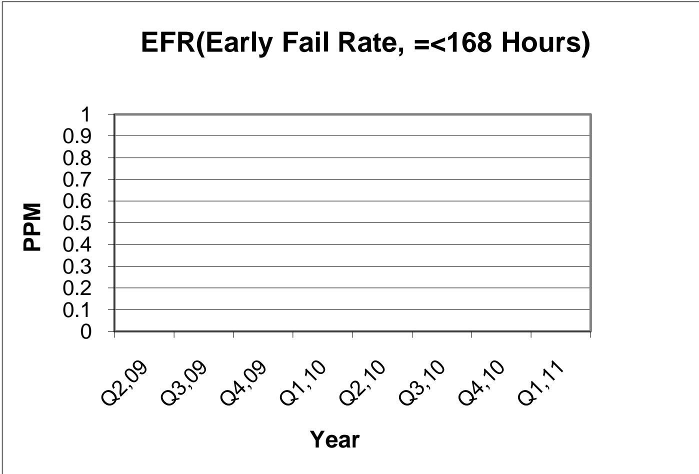


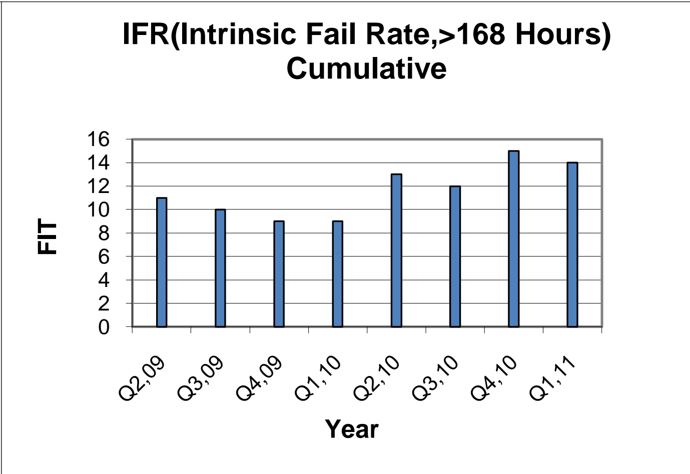


RELIABILITY HTOL DATA @125 °C

FOUNDRY: TSMC Taiwan, Process: 0.13 µm LVCMOS							
	EFR (Early Fail Rate,=< 168 Hours)			FITs @ 60% CL, 55C, Ea = 0.7eV			
YEAR	Sample	# Failure	PPM	Sample	Cum Dev	# Failure	FITs
2005	499	1*	0	499	359,500	0	25
2006	1200	0	0	1199	1,107,800	1**	11
Q1,07	360	0	0	360	1,467,800	0	8
Q2,07	240	0	0	240	1,607,960	0	7
Q4,07	120	0	0	120	1,727,960	0	7
Q1,08	120	0	0	120	1,787,960	0	7
Q2,08	120	0	0	120	1,847,960	0	6
Q3,08	120	0	0	119	1,966,960	1***	13
Q4,08	120	0	0	120	2,086,960	0	12
Q1,09	120	0	0	120	2,206,960	0	12
Q2,09	120	0	0	120	2,326,960	0	11
Q3,09	239	1****	0	239	2,565,960	0	10
Q4,09	240	0	0	240	2,805,960	0	9
Q1,10	240	0	0	240	2,985,960	0	9
Q2,10	240	0	0	240	3,165,960	1***	13
Q3,10	240	0	0	240	3,405,960	0	12
Q4,10	240	0	0	239	3,644,960	1***	15
Q1,11	240	0	0	240	3,884,960	0	14

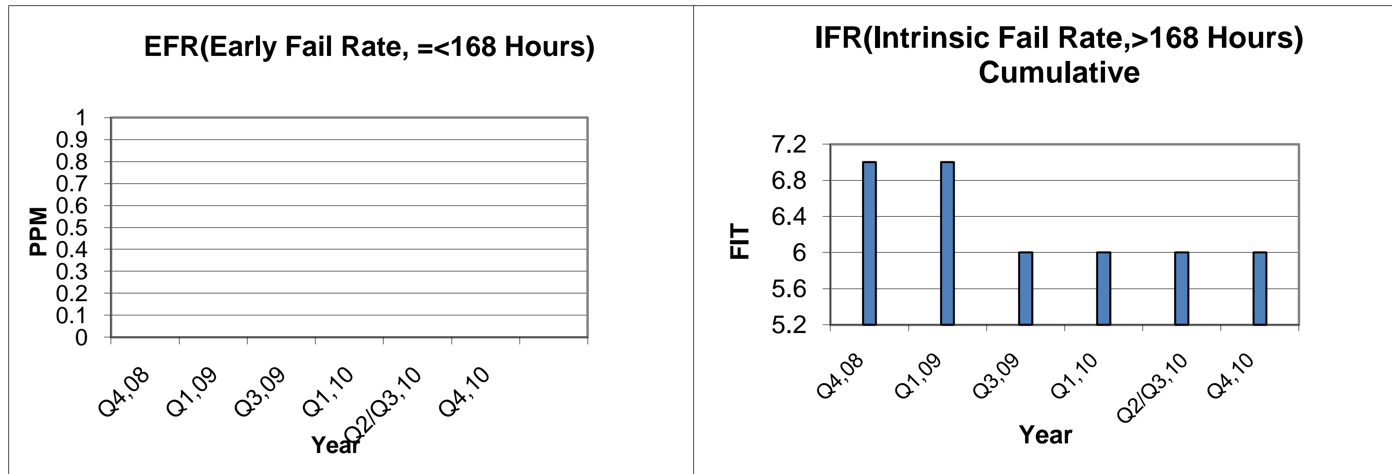
Note:
*** = invalid reject at 168 hrs due to EOS**
**** = invalid reject due to mechanical damage after 1000 hrs**
*****=1 unit functional failure, root cause could not be determined, random failure.**
****** = invalid reject at 168 hrs due to Assy related stitch bond issue.**





RELIABILITY HTOL DATA @125 °C

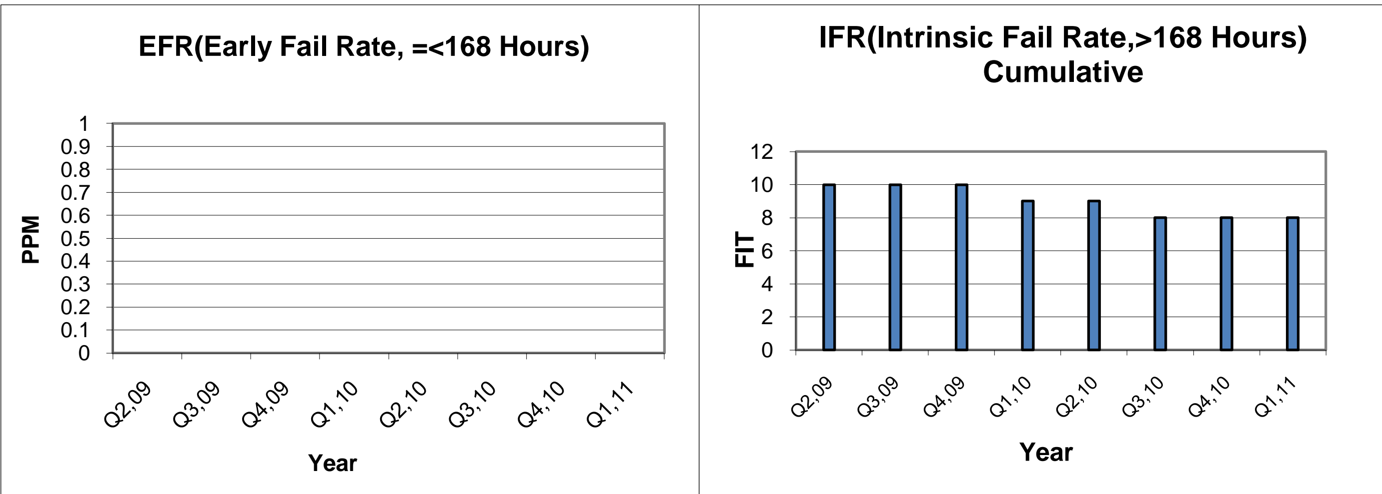
FOUNDRY: Renesas Japan, Process: 0.15 µm CMOS							
	EFR (Early Fail Rate,=< 168 Hours)			FITs @ 60% CL, 55C, Ea = 0.7eV			
YEAR	Sample	# Failure	PPM	Sample	Cum Dev	# Failure	FITs
2000-2007	1366	0	0	1366	1,366,000.00	0	9
Q1,08	120	0	0	120	1,486,000.00	0	8
Q2,08	120	0	0	120	1,606,000.00	0	7
Q3,08	96	0	0	96	1,654,000.00	0	7
Q4,08	96	0	0	96	1,702,000.00	0	7
Q1,09	72	0	0	72	1,774,000.00	0	7
Q3,09	72	0	0	72	1,846,000.00	0	6
Q1,10	44	0	0	44	1,890,000.00	0	6
Q2/Q3,10	45	0	0	45	1,935,000.00	0	6
Q4,10	120	0	0	120	2,055,000.00	0	6
Note:							



RELIABILITY HTOL DATA @125 °C

FOUNDRY: TSMC Taiwan, Process: 0.18 µm CMOS								
	EFR (Early Fail Rate,=< 168 Hours)			FITs @ 60% CL, 55C, Ea = 0.7eV				
YEAR	Sample	# Failure	PPM	Sample	Cum Dev	# Failure	FITs	
2005	480	0	0	480	838,168	0	14	
2006	480	0	0	479	1,314,668	1*	20	
Q1,07	120	0	0	120	1,434,668	0	18	
Q2,07	120	0	0	120	1,554,668	0	17	
Q3,07	119	0	0	119	1,653,676	0	16	
Q4,07	120	0	0	120	1,773,676	0	15	
Q1,08	120	0	0	120	1,833,676	0	14	
Q2,08	120	0	0	120	2,013,676	0	13	
Q3,08	120	0	0	120	2,133,676	0	12	
Q4,08	120	0	0	120	2,253,676	0	12	
Q1,09	120	0	0	120	2,373,676	0	11	
Q2,09	120	0	0	120	2,493,676	0	10	
Q3,09	120	0	0	119	2,612,676	1**	10	
Q4,09	120	0	0	120	2,732,676	0	10	
Q1,10	120	0	0	120	2,852,676	0	9	
Q2,10	120	0	0	120	2,972,676	0	9	
Q3,10	120	0	0	120	3,092,676	0	8	
Q4,10	120	0	0	119	3,211,676	1***	8	
Q1,11	120	0	0	120	3,331,676	0	8	

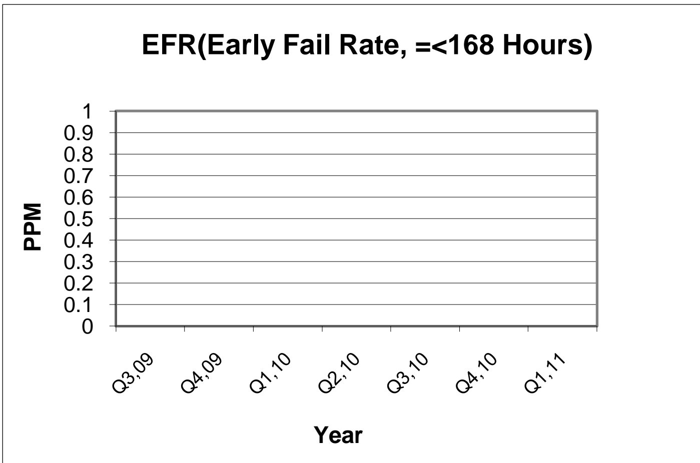
Note: * = 1 unit functional failure, root cause could not be determined, random failure.
** = invalid reject at 500 hrs due to missing solder balls
*** = invalid reject at 1000 hrs due to EOS

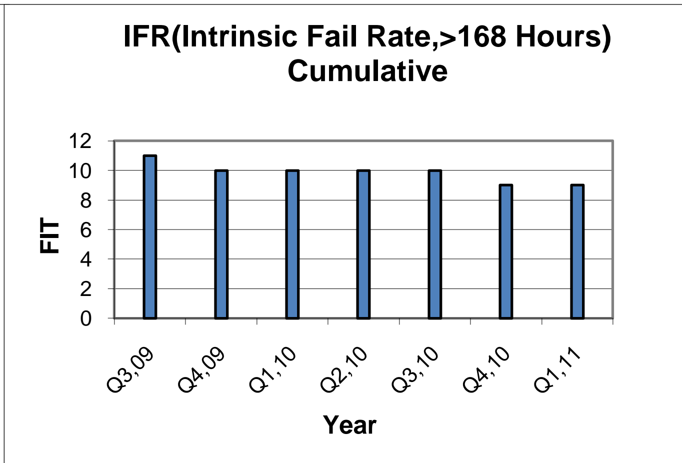


RELIABILITY HTOL DATA @125 °C

FOUNDRY: TSMC Taiwan, Process: 0.25 μm CMOS							
	EFR (Early Fail Rate,=< 168 Hours)			FITs @ 60% CL, 55C, Ea = 0.7eV			
YEAR	Sample	# Failure	PPM	Sample	Cum Dev	# Failure	FITs
2005	480	0	0	477	1,138,096	3*	10
2006	480	0	0	480	1,528,096	0	7
Q1,07	120	0	0	120	1,587,764	0	7
Q2,07	119	0	0	119	1,675,264	1*	7
Q3,07	120	0	0	111	1,786,246	9**	7
Q4,07	120	0	0	120	1,906,264	0	6
Q1,08	120	0	0	120	1,966,264	0	6
Q2,08	120	0	0	120	2,026,264	1***	13
Q3,08	100	0****	0	100	2,126,264	0****	12
Q1,09	100	0****	0	100	2,226,264	0****	12
Q2,09	100	0****	0	100	2,326,264	0****	11
Q3,09	100	0****	0	100	2,426,264	0****	11
Q4,09	100	0****	0	100	2,526,264	0****	10
Q1,10	100	0****	0	100	2,626,264	0****	10
Q2,10	100	0****	0	100	2,626,264	0****	10
Q3,10	100	0****	0	100	2,726,264	0****	10
Q4,10	100	0****	0	100	2,826,264	0****	9
Q1,11	100	0****	0	100	2,926,264	0****	9

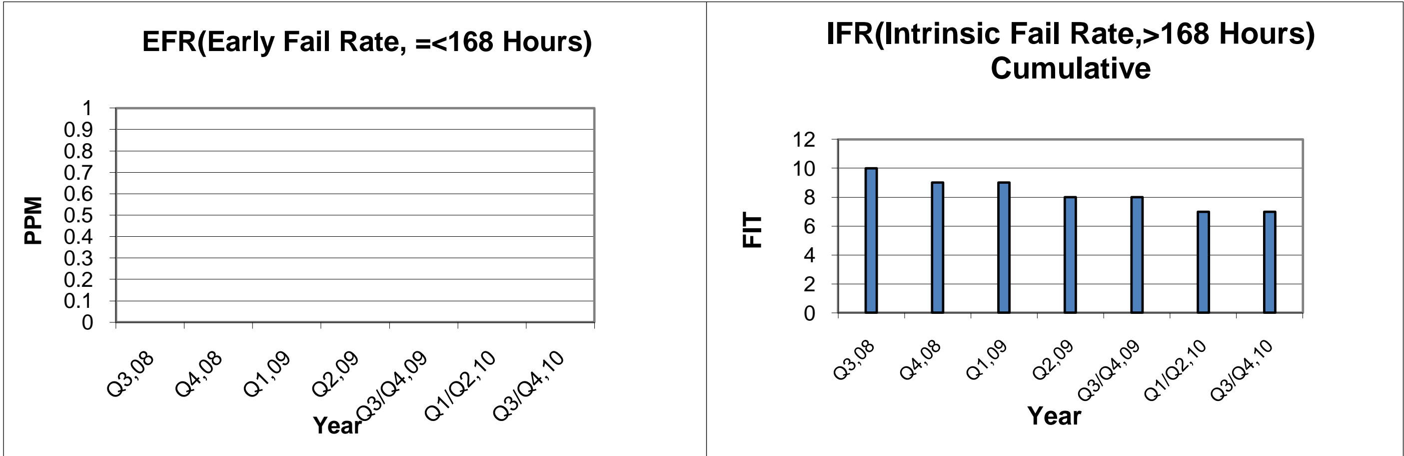
Note: * = mechanical damage after 500 hrs
**** = 9 mechanical damage after 1KH**
*****= 1 unit functional failure after 1000 hrs, root cause could not be determined, random failure.**
******= TSMC Process HTOL Reliability Data.**





RELIABILITY HTOL DATA @125 °C

FOUNDRY: Seiko-Epson Japan, Process: 0.35 µm CMOS							
	EFR (Early Fail Rate,=< 168 Hours)			FITs @ 60% CL, 55C, Ea = 0.7eV			
YEAR	Sample	# Failure	PPM	Sample	Cum Dev	# Failure	FITs
2003	315	0	0	315	240,120	0	24
2004	450	0	0	450	734,230	0	16
2005	225	0	0	225	914,240	0	13
2006	225	0	0	225	1,071,240	0	11
Q1,07	45	0	0	45	1,093,740	0	11
Q2,07	66	0	0	66	1,104,740	0	11
Q1,08	44	0	0	44	1,126,740	0	10
Q2,08	132	0	0	132	1,214,740	0	10
Q3,08	22	0	0	22	1,225,740	0	10
Q4,08	44	0	0	44	1,269,740	0	9
Q1,09	135	0	0	135	1,337,240	0	9
Q2,09	135	0	0	135	1,404,740	0	8
Q3/Q4,09	135	0	0	135	1,539,740	0	8
Q1/Q2,10	135	0	0	135	1,674,740	0	7
Q3/Q4,10	135	0	0	135	1,809,740	0	7
Note:							



RELIABILITY STRESS DATA

Temperature Cycle Test >=500 Cycles, -65/+150 ˚C					
YEAR	PKG TYPE	SAMPLE SIZE	500 cycles	FAILURE RATE (%)	FINAL RESULT (PASS/FAIL)
2008	H/FCBGA	270	0	0	PASS
2009	H/FCBGA	644	0	0	PASS
Q1,10	H/FCBGA	80	0	0	PASS
Q2,10	H/FCBGA	124	0	0	PASS
Q3,10	H/FCBGA	135	0	0	PASS
Q4,10	H/FCBGA	202	0	0	PASS
Q1,11	H/FCBGA	86	0	0	PASS
2008	HSBGA	465	0	0	PASS
2009	HSBGA	909	0	0	PASS
Q1,10	HSBGA	48	0	0	PASS
Q2,10	HSBGA	147	0	0	PASS
Q3,10	HSBGA	197	0	0	PASS
Q4,10	HSBGA	187	0	0	PASS
Q1,11	HSBGA	231	0	0	PASS
2004-2007	PBGA	4833	0	0	PASS
2008	PBGA	1785	0	0	PASS
2009	PBGA	932	0	0	PASS
Q1,10	PBGA	135	0	0	PASS
Q2,10	PBGA	120	0	0	PASS
Q3,10	PBGA	278	0	0	PASS
Q4,10	PBGA	145	0	0	PASS
Q1,11	PBGA	97	0	0	PASS
Q3,10	QFN	185	0	0	PASS
Q4,10	QFN	70	0	0	PASS
Q1,11	QFN	121	0	0	PASS
2004-2007	QFP	1583	0	0	PASS
2008	QFP	651	0	0	PASS
2009	QFP	629	0	0	PASS
Q1,10	QFP	217	0	0	PASS
Q2,10	QFP	120	0	0	PASS
Q3,10	QFP	120	0	0	PASS
Q4,10	QFP	165	0	0	PASS
Q1,11	QFP	267	0	0	PASS
Note:					

ASSEMBLY SUBCON	PACKAGE TECHNOLOGIES
Amkor, Taiwan	HFCBGA
ASE, Kaohsiung	EPQFP, QFN, PBGA, HSBGA, HFCBGA
ASE, Malaysia	PQFP, PBGA, HSBGA
Renesas, Japan	PQFP, PBGA, FBGA
Seiko-Epson, Japan	PQFP, PBGA
STATS ChiPAC, Korea	PBGA, HSBGA
STATS ChiPAC, Singapore	PQFP
UTAC, Singapore	PQFP, EPQFP

RELIABILITY STRESS DATA

Temperature Humidity Test 85/85 or HAST				
YEAR	PKG	SAMPLE	FAILURE RATE	FINAL RESULT
	TYPE	SIZE	(%)	(PASS/FAIL)
2008	H/FCBGA	270	0	PASS
2009	H/FCBGA	585	0	PASS
Q1,10	H/FCBGA	112	0	PASS
Q2,10	H/FCBGA	123	0	PASS
Q3,10	H/FCBGA	135	0	PASS
Q4,10	H/FCBGA	202	0	PASS
Q1,11	H/FCBGA	32	0	PASS
2008	HSBGA	465	0	PASS
2009	HSBGA	909	0	PASS
Q2,10	HSBGA	114	0	PASS
Q3,10	HSBGA	196	0	PASS
Q4,10	HSBGA	187	0	PASS
Q1,11	HSBGA	210	0	PASS
2004-2007	PBGA	5047	0	PASS
2008	PBGA	1785	0	PASS
2009	PBGA	932	0	PASS
Q1,10	PBGA	165	0	PASS
Q2,10	PBGA	120	0	PASS
Q3,10	PBGA	278	0	PASS
Q4,10	PBGA	165	0	PASS
Q1,11	PBGA	97	0	PASS
Q3,10	QFN	45	0	PASS
Q4,10	QFN	90	0	PASS
2004-2007	QFP	2305	0	PASS
2008	QFP	475	0	PASS
2009	QFP	327	0	PASS
Q1,10	QFP	60	0	PASS
Q2,10	QFP	30	0	PASS
Q3,10	QFP	30	0	PASS
Q4,10	QFP	30	0	PASS
Q1,11	QFP	145	0	PASS
Note: Conditions for 85/85 are 1000 Hours, 85C, 85%RH. HAST is an alternative stress with conditions of 96 Hours, 130C, 85%RH.				

ASSEMBLY SUBCON	PACKAGE TECHNOLOGIES
Amkor, Taiwan	HFCBGA
ASE, Kaohsiung	EPQFP, QFN, PBGA, HSBGA, HFCBGA
ASE, Malaysia	PQFP, PBGA, HSBGA
Renesas, Japan	PQFP, PBGA, FBGA
Seiko-Epson, Japan	PQFP, PBGA
STATS ChiPAC, Korea	PBGA, HSBGA
STATS ChiPAC, Singapore	PQFP
UTAC, Singapore	PQFP, EPQFP

RELIABILITY STRESS DATA

Pressure Cooker Test: 168 Hours, 121 ˚C/ 100% RH						
YEAR	PKG	SAMPLE	96 Hours	168 Hours	FAILURE RATE	FINAL RESULT
	TYPE	SIZE	(Ref)	(Accep)	(%)	(PASS/FAIL)
2008	HSBGA	150	0	0	0	PASS
2009	HSBGA	60	0	0	0	PASS
Q2,10	HSBGA	30	0	0	0	PASS
Q3,10	HSBGA	60	0	0	0	PASS
Q4,10	HSBGA	30	0	0	0	PASS
Q1,11	HSBGA	30	0	0	0	PASS
2004-2007	PBGA	1130	0	0	0	PASS
2008	PBGA	120	0	0	0	PASS
2009	PBGA	120	0	0	0	PASS
Q1,10	PBGA	30	0	0	0	PASS
Q3,10	PBGA	30	0	0	0	PASS
Q4,10	PBGA	30	0	0	0	PASS
Q1,11	PBGA	30	0	0	0	PASS
Q3,10	QFN	135	0	0	0	PASS
Q4,10	QFN	70	0	0	0	PASS
Q1,11	QFN	45	0	0	0	PASS
2004-2007	QFP	6792	0	0	0	PASS
2008	QFP	474	0	0	0	PASS
2009	QFP	337	0	0	0	PASS
Q1,10	QFP	88	0	0	0	PASS
Q2,10	QFP	75	0	0	0	PASS
Q3,10	QFP	30	0	0	0	PASS
Q4,10	QFP	165	0	0	0	PASS
Q1,11	QFP	132	0	0	0	PASS
Note:						

ASSEMBLY SUBCON	PACKAGE TECHNOLOGIES
Amkor, Taiwan	HFCBGA
ASE, Kaohsiung	EPQFP, QFN, PBGA, HSBGA, HFCBGA
ASE, Malaysia	PQFP, PBGA, HSBGA
Renesas, Japan	PQFP, PBGA, FBGA
Seiko-Epson, Japan	PQFP, PBGA
STATS ChiPAC, Korea	PBGA, HSBGA
STATS ChiPAC, Singapore	PQFP
UTAC, Singapore	PQFP, EPQFP