

RELIABILITY MONITOR REPORT  
FOR

**LQFP Package**

**Dallas Semiconductor**

4401 South Beltwood Parkway  
Dallas, TX 75244-3292

This Report was prepared by  
Dallas Semiconductor Reliability Engineering

**Summary:**

The data in the tables that follow was generated as the result of an on-going Package Reliability Monitor. The assemblies covered by this package monitor are:

ASSY SITE	PINS	PACKAGE		
ATK (Amkor, K)	100	LQFP	ATK (Amkor, K)	128 LQFP
ATK (Amkor, K)	144	LQFP	ATK (Amkor, K)	48 LQFP
ATK (Amkor, K)	64	LQFP	ATK (Amkor, K)	100 LQFP (Pb-Free)
ATK (Amkor, K)	128	LQFP (Pb-Free)	ATK (Amkor, K)	144 LQFP (Pb-Free)
ATK (Amkor, K)	48	LQFP (Pb-Free)	ATK (Amkor, K)	64 LQFP (Pb-Free)
ATK (Amkor, K)	144	LQFP Exposed Pad (Pb-Free)	ATK (Amkor, K)	48 LQFP Exposed Pad (Pb-Free)
ATP (Amkor, PI)	100	LQFP	ATP (Amkor, PI)	128 LQFP
ATP (Amkor, PI)	100	LQFP (Pb-Free)	SCS (Stats Chippac S	100 LQFP
SCS (Stats Chippac S	128	LQFP	SCS (Stats Chippac S	48 LQFP
SCS (Stats Chippac S	64	LQFP	SCS (Stats Chippac S	100 LQFP (Pb-Free)
SCS (Stats Chippac S	128	LQFP (Pb-Free)		

The calculated failure rate for this assembly is:

**FAILURE RATE: MTTF (YRS): 39664 FITS: 2.9**

The parameters used to calculate this failure rate are as follows:

**Cf: 60% Ea: 0.7 Tu: 25 °C**

The reliability data follows. At the start of this data is a description of the assembly vehicle used to generate this reliability data. The next section is the detailed reliability data for each stress. The reliability data section includes the latest data available. This report covers data between 4/1/2006 and 3/31/2007.

**Assembly Information:**

Package Type: LQFP 14x14x1.4  
 Flammability: UL 94-V0  
 Moisture Sensitivity (JEDEC J-STD20A) Level 4  
 Date Code Range: 0607 to 0635

**MOISTURE SENSITIVITY LEVEL 3**

DESCRIPTION	DATE CODE	TEST VEHICLE	CONDITION	READPOINT	QUANTITY	FAILS	FA NO
ULTRASOUND	0614	DS21Q50	J-STD-020		22	0	
STORAGE LIFE			125C	24 HRS	22		
MOISTURE SOAK			30C/60% R.H.	192 HRS	22		
CONVECTION REFLOW			235C +/-0C	3 PASS	22	0	
EXTERNAL VISUAL			J-STD-020, 6.1a		22	0	
PRECONDITION U/S			J-STD-020		22	0	
<b>Total:</b>						<b>0</b>	

**OPERATING LIFE**

DESCRIPTION	DATE CODE	TEST VEHICLE	CONDITION	READPOINT	QUANTITY	FAILS	FA NO
HIGH TEMP OP LIFE	0607	DS2155	125C, 3.5 VOLTS	1000 HRS	77	1	30048301
HIGH TEMP OP LIFE	0614	DS21Q50	125C, 3.5 VOLTS	1000 HRS	45	0	
HIGH TEMP OP LIFE	0617	DS2155	125C, 3.5 VOLTS	1000 HRS	77	0	
HIGH TEMP OP LIFE	0618	DS2155	125C, 3.5 VOLTS	1000 HRS	77	0	

HIGH TEMP OP LIFE	0629	DS2155	125C, 3.5 VOLTS	1000 HRS	77	0
HIGH TEMP OP LIFE	0635	DS2155	125C, 3.5 VOLTS	1000 HRS	77	0
<b>Total:</b>						<b>1</b>

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### PRECONDITIONING LEVEL 3

DESCRIPTION	DATE CODE	TEST VEHICLE	CONDITION	READPOINT	QUANTITY	FAILS	FA NO
STORAGE LIFE	0614	DS21Q50	125C	24 HRS	276		
MOISTURE SOAK			30C/60% R.H.	192 HRS	276		
CONVECTION REFLOW			235C +5/-0C	3 PASS	276	0	
STORAGE LIFE	0617	DS2155	125C	24 HRS	199		
MOISTURE SOAK			30C/60% R.H.	192 HRS	199		
CONVECTION REFLOW			235C +5/-0C	3 PASS	199	0	
STORAGE LIFE	0629	DS2155	125C	24 HRS	199		
MOISTURE SOAK			30C/60% R.H.	192 HRS	199		
CONVECTION REFLOW			235C +5/-0C	3 PASS	199	0	
STORAGE LIFE	0635	DS2155	125C	24 HRS	199		
MOISTURE SOAK			30C/60% R.H.	192 HRS	199		
CONVECTION REFLOW			235C +5/-0C	3 PASS	199	0	
<b>Total:</b>						<b>0</b>	

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### STORAGE LIFE

DESCRIPTION	DATE CODE	TEST VEHICLE	CONDITION	READPOINT	QUANTITY	FAILS	FA NO
STORAGE LIFE	0614	DS21Q50	150C	1000 HRS	77	0	
<b>Total:</b>						<b>0</b>	

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### TEMPERATURE CYCLE

DESCRIPTION	DATE CODE	TEST VEHICLE	CONDITION	READPOINT	QUANTITY	FAILS	FA NO
TEMP CYCLE	0607	DS2155	-55C TO 125C	1000 CYS	77	0	
TEMP CYCLE	0614	DS21Q50	-55C TO 125C	1000 CYS	77	0	
TEMP CYCLE	0617	DS2155	-55C TO 125C	1000 CYS	77	0	
TEMP CYCLE	0629	DS2155	-55C TO 125C	1000 CYS	77	0	
TEMP CYCLE	0635	DS2155	-55C TO 125C	1000 CYS	75	0	
<b>Total:</b>						<b>0</b>	

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### TEMPERATURE HUMIDITY BIAS

DESCRIPTION	DATE CODE	TEST VEHICLE	CONDITION	READPOINT	QUANTITY	FAILS	FA NO
HAST	0607	DS2155	130C, 85%R.H.,3.5V	96 HRS	45	0	
HAST	0617	DS2155	130C, 85%R.H.,3.5V	96 HRS	45	0	
HAST	0629	DS2155	130C, 85%R.H.,3.5V	96 HRS	45	0	
HAST	0635	DS2155	130C, 85%R.H.,3.5V	96 HRS	44	0	
<b>Total:</b>						<b>0</b>	

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### UNBIASED MOISTURE RESISTANCE

DESCRIPTION	DATE CODE	TEST VEHICLE	CONDITION	READPOINT	QUANTITY	FAILS	FA NO
HAST, NO BIAS	0607	DS2155	130C, 85% R.H.	200 HRS	77	0	
HAST, NO BIAS	0614	DS21Q50	130C, 85% R.H.	100 HRS	75	0	

HAST, NO BIAS	0617	DS2155	130C, 85% R.H.	200	HRS	75	0
HAST, NO BIAS	0629	DS2155	130C, 85% R.H.	200	HRS	77	0
HAST, NO BIAS	0635	DS2155	130C, 85% R.H.	192	HRS	76	0
<b>Total:</b>						<b>0</b>	<b>0</b>

**Assembly Information:**

Package Type: LQFP (Pb-Free) 14x14x1.4  
 Flammability: UL 94-V0  
 Moisture Sensitivity (JEDEC J-STD20A) Level 4  
 Date Code Range: 0621 to 0627

**MOISTURE SENSITIVITY LEVEL 3**

DESCRIPTION	DATE CODE	TEST VEHICLE	CONDITION	READPOINT	QUANTITY	FAILS	FA NO
ULTRASOUND	0621	DS21Q50	J-STD-020		22	0	
STORAGE LIFE			125C	24	HRS	22	
MOISTURE SOAK			30C/60% R.H.	192	HRS	22	
CONVECTION REFLOW			260C +/-5C	3	PASS	22	0
EXTERNAL VISUAL			J-STD-020, 6.1a			22	0
PRECONDITION U/S			J-STD-020			22	0
ULTRASOUND	0621	DS21Q50	J-STD-020		22	0	
STORAGE LIFE			125C	24	HRS	22	
MOISTURE SOAK			30C/60% R.H.	192	HRS	22	
CONVECTION REFLOW			260C +/-5C	3	PASS	22	0
EXTERNAL VISUAL			J-STD-020, 6.1a			22	0
PRECONDITION U/S			J-STD-020			22	0
ULTRASOUND	0622	DS21Q50	J-STD-020		22	0	
STORAGE LIFE			125C	24	HRS	22	
MOISTURE SOAK			30C/60% R.H.	192	HRS	22	
CONVECTION REFLOW			260C +/-5C	3	PASS	22	0
EXTERNAL VISUAL			J-STD-020, 6.1a			22	0
PRECONDITION U/S			J-STD-020			22	0
ULTRASOUND	0627	DS21354	J-STD-020		8	0	
STORAGE LIFE			125C	24	HRS	8	
MOISTURE SOAK			30C/60% R.H.	192	HRS	8	
CONVECTION REFLOW			260C +/-5C	3	PASS	8	0
EXTERNAL VISUAL			J-STD-020, 6.1a			8	0
PRECONDITION U/S			J-STD-020			8	0
<b>Total:</b>						<b>0</b>	<b>0</b>

**OPERATING LIFE**

DESCRIPTION	DATE CODE	TEST VEHICLE	CONDITION	READPOINT	QUANTITY	FAILS	FA NO
HIGH TEMP OP LIFE	0621	DS21Q50	125C, 3.5 VOLTS	1000	HRS	45	0
HIGH TEMP OP LIFE	0621	DS21Q50	125C, 3.5 VOLTS	1000	HRS	45	0
HIGH TEMP OP LIFE	0622	DS21Q50	125C, 3.5 VOLTS	1000	HRS	45	0
HIGH TEMP OP LIFE	0627	DS21354	125C, 3.5 VOLTS	1000	HRS	45	0
<b>Total:</b>						<b>0</b>	<b>0</b>

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**PACKAGE TESTS**

DESCRIPTION	DATE CODE	TEST VEHICLE	CONDITION	READPOINT	QUANTITY	FAILS	FA NO
SOLDERABILITY (Sn/Pb)	0621	DS21Q50	JESD22-B102, COND C		3	0	
SOLDERABILITY (Pb-Free)			JESD22-B102, COND C		3	0	
X-RAY	0621	DS21Q50	MIL-STD-883-2012 : TOP & SIDE VIEW		6	0	
PHYSICAL DIMENSIONS			JESD22-B100		6	0	
MARK PERMANENCY			JESD22-B107		6	0	
LEAD INTEGRITY			JESD22-B105, COND B		6	0	
EXTERNAL VISUAL			JESD22-B101		6	0	
EDX			25 C		6	0	
SOLDERABILITY (Sn/Pb)	0621	DS21Q50	JESD22-B102, COND C		3	0	
SOLDERABILITY (Pb-Free)			JESD22-B102, COND C		3	0	
X-RAY	0621	DS21Q50	MIL-STD-883-2012 : TOP & SIDE VIEW		6	0	
PHYSICAL DIMENSIONS			JESD22-B100		6	0	
MARK PERMANENCY			JESD22-B107		6	0	
LEAD INTEGRITY			JESD22-B105, COND B		6	0	
EXTERNAL VISUAL			JESD22-B101		6	0	
EDX			25 C		6	0	
SOLDERABILITY (Sn/Pb)	0622	DS21Q50	JESD22-B102, COND C		3	0	
SOLDERABILITY (Pb-Free)			JESD22-B102, COND C		3	0	
X-RAY	0622	DS21Q50	MIL-STD-883-2012 : TOP & SIDE VIEW		6	0	
PHYSICAL DIMENSIONS			JESD22-B100		6	0	
MARK PERMANENCY			JESD22-B107		6	0	
LEAD INTEGRITY			JESD22-B105, COND B		6	0	
EXTERNAL VISUAL			JESD22-B101		6	0	
EDX			25 C		6	0	
SOLDERABILITY (Sn/Pb)	0627	DS21354	JESD22-B102, COND C		3	0	
SOLDERABILITY (Pb-Free)			JESD22-B102, COND C		3	0	
X-RAY	0627	DS21354	MIL-STD-883-2012 : TOP & SIDE VIEW		6	0	
PHYSICAL DIMENSIONS			JESD22-B100		6	0	
MARK PERMANENCY			JESD22-B107		6	0	
LEAD INTEGRITY			JESD22-B105, COND B		6	0	
EXTERNAL VISUAL			JESD22-B101		6	0	
EDX			25 C		6	0	
<b>Total:</b>						<b>0</b>	

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**PRECONDITIONING LEVEL 3**

DESCRIPTION	DATE CODE	TEST VEHICLE	CONDITION	READPOINT	QUANTITY	FAILS	FA NO
STORAGE LIFE	0621	DS21Q50	125C	24 HRS	276		
MOISTURE SOAK			30C/60% R.H.	192 HRS	276		
CONVECTION REFLOW			260C +/-5C	3 PASS	276	0	
STORAGE LIFE	0621	DS21Q50	125C	24 HRS	276		
MOISTURE SOAK			30C/60% R.H.	192 HRS	276		
CONVECTION REFLOW			260C +/-5C	3 PASS	276	0	
STORAGE LIFE	0622	DS21Q50	125C	24 HRS	276		
MOISTURE SOAK			30C/60% R.H.	192 HRS	276		

CONVECTION REFLOW	0622	DS21Q50	260C +/-5C	3	PASS	276	0
STORAGE LIFE	0626	DS80C400	125C	24	HRS	45	
MOISTURE SOAK			30C/60% R.H.	192	HRS	45	
CONVECTION REFLOW			260C +/-5C	3	PASS	45	0
STORAGE LIFE	0626	DS80C400	125C	24	HRS	45	
MOISTURE SOAK			30C/60% R.H.	192	HRS	45	
CONVECTION REFLOW			260C +/-5C	3	PASS	45	0
STORAGE LIFE	0626	DS80C400	125C	24	HRS	45	
MOISTURE SOAK			30C/60% R.H.	192	HRS	45	
CONVECTION REFLOW			260C +/-5C	3	PASS	45	0
STORAGE LIFE	0627	DS21354	125C	24	HRS	321	
MOISTURE SOAK			30C/60% R.H.	192	HRS	321	
CONVECTION REFLOW			260C +/-5C	3	PASS	321	0
<b>Total:</b>						<b>0</b>	<b>0</b>

### STORAGE LIFE

DESCRIPTION	DATE CODE	TEST VEHICLE	CONDITION	READPOINT	QUANTITY	FAILS	FA NO
STORAGE LIFE	0621	DS21Q50	150C	1000 HRS	77	0	
STORAGE LIFE	0621	DS21Q50	150C	1000 HRS	77	0	
STORAGE LIFE	0622	DS21Q50	150C	1000 HRS	77	0	
STORAGE LIFE	0627	DS21354	150C	1000 HRS	77	0	
<b>Total:</b>						<b>0</b>	<b>0</b>

### TEMPERATURE CYCLE

DESCRIPTION	DATE CODE	TEST VEHICLE	CONDITION	READPOINT	QUANTITY	FAILS	FA NO
TEMP CYCLE	0621	DS21Q50	-55C TO 125C	1000 CYS	77	0	
TEMP CYCLE	0621	DS21Q50	-55C TO 125C	1000 CYS	77	0	
TEMP CYCLE	0622	DS21Q50	-55C TO 125C	1000 CYS	77	0	
TEMP CYCLE	0627	DS21354	-55C TO 125C	1000 CYS	77	0	
<b>Total:</b>						<b>0</b>	<b>0</b>

### TEMPERATURE HUMIDITY BIAS

DESCRIPTION	DATE CODE	TEST VEHICLE	CONDITION	READPOINT	QUANTITY	FAILS	FA NO
HAST	0626	DS80C400	130C, 85%R.H.,3.5V	100 HRS	45	0	
HAST	0626	DS80C400	130C, 85%R.H.,3.5V	100 HRS	45	0	
HAST	0626	DS80C400	130C, 85%R.H.,3.5V	100 HRS	44	0	
HAST	0627	DS21354	130C, 85%R.H.,3.5V	96 HRS	45	0	
<b>Total:</b>						<b>0</b>	<b>0</b>

### UNBIASED MOISTURE RESISTANCE

DESCRIPTION	DATE CODE	TEST VEHICLE	CONDITION	READPOINT	QUANTITY	FAILS	FA NO
HAST, NO BIAS	0621	DS21Q50	130C, 85% R.H.	200 HRS	77	0	
HAST, NO BIAS	0621	DS21Q50	130C, 85% R.H.	200 HRS	77	0	
HAST, NO BIAS	0622	DS21Q50	130C, 85% R.H.	200 HRS	77	0	
HAST, NO BIAS	0627	DS21354	130C, 85% R.H.	200 HRS	74	0	

Total: 0

**Assembly Information:**

Package Type: LQFP (Pb-Free) 14x20x1.4  
Flammability: UL 94-V0  
Moisture Sensitivity (JEDEC J-STD20A) Level 4  
Date Code Range: 0609 to 0609

**MOISTURE SENSITIVITY LEVEL 4**

DESCRIPTION	DATE CODE	TEST VEHICLE	CONDITION	READPOINT	QUANTITY	FAILS	FA NO
ULTRASOUND	0609	DS21448	J-STD-020		8	0	
STORAGE LIFE			125C	24 HRS	8		
MOISTURE SOAK			30C/60% R.H.	96 HRS	8		
CONVECTION REFLOW			260C +0/-5C	3 PASS	8	0	
EXTERNAL VISUAL			J-STD-020, 6.1a		8	0	
PRECONDITION U/S			J-STD-020		8	0	
ULTRASOUND	0609	DS21448	J-STD-020		8	0	
STORAGE LIFE			125C	24 HRS	8		
MOISTURE SOAK			30C/60% R.H.	96 HRS	8		
CONVECTION REFLOW			260C +0/-5C	3 PASS	8	0	
EXTERNAL VISUAL			J-STD-020, 6.1a		8	0	
PRECONDITION U/S			J-STD-020		8	0	
<b>Total:</b>						<b>0</b>	

**OPERATING LIFE**

DESCRIPTION	DATE CODE	TEST VEHICLE	CONDITION	READPOINT	QUANTITY	FAILS	FA NO
HIGH TEMP OP LIFE	0609	DS21448	125C, 3.5 VOLTS	1000 HRS	45	0	
HIGH TEMP OP LIFE	0609	DS21448	125C, 3.5 VOLTS	1000 HRS	45	0	
<b>Total:</b>						<b>0</b>	

**PACKAGE TESTS**

DESCRIPTION	DATE CODE	TEST VEHICLE	CONDITION	READPOINT	QUANTITY	FAILS	FA NO
SOLDERABILITY (Sn/Pb)	0609	DS21448	JESD22-B102, COND C		3	0	
SOLDERABILITY (Pb-Free)			JESD22-B102, COND C		3	0	
X-RAY	0609	DS21448	MIL-STD-883-2012 : TOP & SIDE VIEW		6	0	
PHYSICAL DIMENSIONS			JESD22-B100		6	0	
MARK PERMANENCY			JESD22-B107		6	0	
LEAD INTEGRITY			JESD22-B105, COND B		6	0	
EXTERNAL VISUAL			JESD22-B101		6	0	
EDX			25 C		6	0	
SOLDERABILITY (Sn/Pb)	0609	DS21448	JESD22-B102, COND C		3	0	
SOLDERABILITY (Pb-Free)			JESD22-B102, COND C		3	0	
X-RAY	0609	DS21448	MIL-STD-883-2012 : TOP & SIDE VIEW		6	0	
PHYSICAL DIMENSIONS			JESD22-B100		6	0	
MARK PERMANENCY			JESD22-B107		6	0	
LEAD INTEGRITY			JESD22-B105, COND B		6	0	
EXTERNAL VISUAL			JESD22-B101		6	0	
EDX			25 C		6	0	

Total: 0

**PRECONDITIONING LEVEL 4**

DESCRIPTION	DATE CODE	TEST VEHICLE	CONDITION	READPOINT	QUANTITY	FAILS	FA NO
STORAGE LIFE	0609	DS21448	125C	24 HRS	321		
MOISTURE SOAK			30C/60% R.H.	96 HRS	321		
CONVECTION REFLOW			260C +/-5C	3 PASS	321	0	
STORAGE LIFE	0609	DS21448	125C	24 HRS	321		
MOISTURE SOAK			30C/60% R.H.	96 HRS	321		
CONVECTION REFLOW			260C +/-5C	3 PASS	321	0	
<b>Total:</b>						<b>0</b>	

**STORAGE LIFE**

DESCRIPTION	DATE CODE	TEST VEHICLE	CONDITION	READPOINT	QUANTITY	FAILS	FA NO
STORAGE LIFE	0609	DS21448	150C	1000 HRS	76	0	
STORAGE LIFE	0609	DS21448	150C	1000 HRS	76	0	
<b>Total:</b>						<b>0</b>	

**TEMPERATURE CYCLE**

DESCRIPTION	DATE CODE	TEST VEHICLE	CONDITION	READPOINT	QUANTITY	FAILS	FA NO
TEMP CYCLE	0609	DS21448	-55C TO 125C	1000 CYS	77	0	
TEMP CYCLE	0609	DS21448	-55C TO 125C	1000 CYS	76	0	
<b>Total:</b>						<b>0</b>	

**TEMPERATURE HUMIDITY BIAS**

DESCRIPTION	DATE CODE	TEST VEHICLE	CONDITION	READPOINT	QUANTITY	FAILS	FA NO
BIASED MOISTURE	0609	DS21448	85/85, 3.5 VOLTS	1000 HRS	45	0	
BIASED MOISTURE	0609	DS21448	85/85, 3.5 VOLTS	1000 HRS	45	0	
<b>Total:</b>						<b>0</b>	

**UNBIASED MOISTURE RESISTANCE**

DESCRIPTION	DATE CODE	TEST VEHICLE	CONDITION	READPOINT	QUANTITY	FAILS	FA NO
HAST, NO BIAS	0609	DS21448	130C, 85% R.H.	200 HRS	76	0	
HAST, NO BIAS	0609	DS21448	130C, 85% R.H.	200 HRS	76	0	
<b>Total:</b>						<b>0</b>	

**Assembly Information:**

Package Type: LQFP (Pb-Free) 20x20x1.4  
Flammability: UL 94-V0  
Moisture Sensitivity (JEDEC J-STD20A) Level 4  
Date Code Range: 0632 to 0632

**OPERATING LIFE**

DESCRIPTION	DATE CODE	TEST VEHICLE	CONDITION	READPOINT	QUANTITY	FAILS	FA NO
HIGH TEMP OP LIFE	0632	DS26303	125C, 3.5 VOLTS	1000 HRS	45	0	
<b>Total:</b>						<b>0</b>	

**FAILURE RATE: MTTF (YRS): 39664 FITS: 2.9**