



7/26/2005

RELIABILITY REPORT
FOR

DS2045W, Rev A

Dallas Semiconductor

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Prepared by:

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Conclusion

The following qualification successfully meets the quality and reliability standards required of all Dallas Semiconductor products and processes:

DS2045W, Rev A

In addition, Dallas Semiconductor's continuous reliability monitor program ensures that all outgoing product will continue to meet Maxim's quality and reliability standards. The current status of the reliability monitor program can be viewed at <http://www.maxim-ic.com/TechSupport/dsreliability.html>.*

Module Description

A description of this Module can be found in the product data sheet. You can find the product data sheet at http://dbserv.maxim-ic.com/l_datasheet3.cfm.*

Reliability Derating:

A module device consists of one or more IC's in a single, upward integrated, package. This package is assembled to include batteries, crystals, and other piece parts that make up the configuration of the Module. Because of either the complexity of the package or the included piece parts, standard high temperature reliability testing is not possible. Therefore, in order to determine the reliability of module products, the reliability of each of the piece parts is individually determined, then summed to determine the reliability of the integrated module product. If there are "n" significant components in the module then:

$$\begin{aligned} \text{Fr (module)} &= \text{Fr (1)} + \text{Fr (2)} + \text{Fr (3)} + \dots + \text{Fr (n)} \\ \text{Fr (module)} &= \text{Failure rate of module} \\ \text{Fr(n)} &= \text{Failure rate of the nth component} \end{aligned}$$

Failure Rates are reported in FITs (Failures in Time) or MTTF (Mean Time To Failure). The FIT rate is related to MTTF by:

$$\text{MTTF} = 1/\text{Fr}$$

NOTE: MTTF is frequently used interchangeably with MTBF.

The calculated failure rate for this module/assembly is

Module Device:	Module Units	Quantity:	Fails:	Ea:	MTTF (Yrs):	FITs:
1 MEG SRAM 3V	1	1788	1	0.7	58482	2.0
DS1310	1	1419	0	0.7	162214	0.7
ML2020R	1	45	0	0.7	3527	32.4
Totals:					3259	35.0

The parameters used to calculate the module failure rate are as follows

Cf: 60% **Tu: 25 °C**

The reliability data follows. At the start of this data is the module assembly information. This is a description of the module. The next section is the detailed reliability data for each stress found in the qualification / monitor. If there are additional processes or assemblies used as part of this report, a description of each will follow which includes the respective reliability data for that process/ assembly. The reliability data section includes the latest data available. Some of this data may be generic with other packages or products.

* Some proprietary products may be excepted from this requirement

Assembly Information:

Assembly Site: Dallas
 Pin Count: 256
 Package Type: Single Piece BGA Module w/Battery
 Body Size: 27x27x7.9
 Mold Compound: n/a
 Lead Frame: PCB; BT
 Lead Finsh: SnPb Ball
 Die Attach: n/a
 Bond Wire / Size: Au / 1.0 mil
 Flammability: UL 94-V0
 Moisture Sensitivity (JEDEC J-STD20A) Level 3
 Date Code Range: 0435 to 0452

CONSTRUCTION ANALYSIS

DESCRIPTION	DATE CD	CONDITION	READPOINT	QTY	FAILS	FA#
PACKAGE, ASSEMBLY PROCESS	0447	TO BE DONE BY F/A	2	3	0	30034485
PACKAGE, ASSEMBLY PROCESS	0447	TO BE DONE BY F/A	2	3	0	30034483
Total:					0	

MECHANICAL LIFE

DESCRIPTION	DATE CD	CONDITION	READPOINT	QTY	FAILS	FA#
MECHANICAL SHOCK	0435	200G, 1/2 SINE, 6 MS	30	CYS	22	0
GROSS LEAK		25 C, AIR PRESSURE DECAY			22	0
EXTERNAL VISUAL		JESD22-B101			22	0
VIBRATION, VARIABLE FREQUENCY	0435	10g or 0.06", 5Hz-2KHz, X Y Z axis	9	HRS	22	0
GROSS LEAK		25 C, AIR PRESSURE DECAY			22	0
EXTERNAL VISUAL		JESD22-B101			22	0
MECHANICAL SHOCK	0435	200G, 1/2 SINE, 6 MS	30	CYS	22	0
GROSS LEAK		25 C, AIR PRESSURE DECAY			22	0
EXTERNAL VISUAL		JESD22-B101			22	0
VIBRATION, VARIABLE FREQUENCY	0435	10g or 0.06", 5Hz-2KHz, X Y Z axis	9	HRS	22	0
GROSS LEAK		25 C, AIR PRESSURE DECAY			22	0
EXTERNAL VISUAL		JESD22-B101			22	0
MECHANICAL SHOCK	0435	200G, 1/2 SINE, 6 MS	30	CYS	22	0
GROSS LEAK		25 C, AIR PRESSURE DECAY			22	0

EXTERNAL VISUAL	0435	JESD22-B101			22	0
VIBRATION, VARIABLE FREQUENCY	0435	10g or 0.06", 5Hz-2KHz, X Y Z axis	9	HRS	22	0
GROSS LEAK		25 C, AIR PRESSURE DECAY			22	0
EXTERNAL VISUAL		JESD22-B101			22	0
Total:					0	0

PACKAGE TESTS

DESCRIPTION	DATE CD	CONDITION	READPOINT	QTY	FAILS	FA#
X-RAY	0439	MIL-STD-883-2012 : TOP & SIDE VIEW		6	0	
PHYSICAL DIMENSIONS		JESD22-B100		6	0	
MARK PERMANENCY		JESD22-B107		6	0	
BALL SHEAR		JESD22-B117		6	0	
EXTERNAL VISUAL		JESD22-B101		6	0	
X-RAY	0447	MIL-STD-883-2012 : TOP & SIDE VIEW		6	0	
PHYSICAL DIMENSIONS		JESD22-B100		6	0	
MARK PERMANENCY		JESD22-B107		6	0	
BALL SHEAR		JESD22-B117		6	0	
EXTERNAL VISUAL		JESD22-B101		6	0	
X-RAY	0447	MIL-STD-883-2012 : TOP & SIDE VIEW		6	0	
PHYSICAL DIMENSIONS		JESD22-B100		6	0	
MARK PERMANENCY		JESD22-B107		6	0	
BALL SHEAR		JESD22-B117		6	0	
X-RAY	0452	MIL-STD-883-2012 : TOP & SIDE VIEW		6	0	
PHYSICAL DIMENSIONS		JESD22-B100		6	0	
MARK PERMANENCY		JESD22-B107		6	0	
BALL SHEAR		JESD22-B117		6	0	
EXTERNAL VISUAL		JESD22-B101		6	0	
Total:					0	0

PRECONDITIONING LEVEL 3

DESCRIPTION	DATE CD	CONDITION	READPOINT	QTY	FAILS	FA#
STORAGE LIFE	0439	125C	48 HRS	345		
MOISTURE SOAK		30C/60% R.H.	192 HRS	345		
CONVECTION REFLOW		220C +5/-0C	2 PASS	345	0	
GROSS LEAK		25 C, AIR PRESSURE DECAY		345	0	
EXTERNAL VISUAL		JESD22-B101		345	0	
STORAGE LIFE	0447	125C	48 HRS	219		
MOISTURE SOAK		30C/60% R.H.	192 HRS	219		
CONVECTION REFLOW		220C +5/-0C	2 PASS	219	0	
GROSS LEAK		25 C, AIR PRESSURE DECAY		219	0	
EXTERNAL VISUAL		JESD22-B101		219	0	
STORAGE LIFE	0447	125C	48 HRS	205		
MOISTURE SOAK		30C/60% R.H.	192 HRS	205		
CONVECTION REFLOW		220C +5/-0C	2 PASS	205	0	
GROSS LEAK		25 C, AIR PRESSURE DECAY		205	0	
EXTERNAL VISUAL		JESD22-B101		205	0	
STORAGE LIFE	0452	125C	48 HRS	269		

MOISTURE SOAK	0452	30C/60% R.H.	192	HRS	269	
CONVECTION REFLOW		220C +5/-0C	2	PASS	269	0
GROSS LEAK		25 C, AIR PRESSURE DECAY			269	0
EXTERNAL VISUAL		JESD22-B101			269	0
Total:					0	0

STORAGE LIFE

DESCRIPTION	DATE CD	CONDITION	READPOINT	QTY	FAILS	FA#
STORAGE LIFE	0447	85 C	1000 HRS	65	0	
STORAGE LIFE	0447	85 C	1000 HRS	51	0	
STORAGE LIFE	0452	85 C	1000 HRS	114	0	
Total:					0	0

TEMPERATURE CYCLE

DESCRIPTION	DATE CD	CONDITION	READPOINT	QTY	FAILS	FA#
TEMP CYCLE	0447	-40 TO 85C	1000 CYS	77	0	
TEMP CYCLE	0447	-40 TO 85C	1000 CYS	77	0	
TEMP CYCLE	0452	-40 TO 85C	1000 CYS	77	0	
Total:					0	0

TEMPERATURE HUMIDITY BIAS

DESCRIPTION	DATE CD	CONDITION	READPOINT	QTY	FAILS	FA#
FLUX DIP & H2O RINSE	0447	JESD22-A113	1 HRS	77	0	
BIASED MOISTURE (BATTERY)		60C/90% R.H., BATTERY BIAS	1000 HRS	77	0	
FLUX DIP & H2O RINSE	0447	JESD22-A113	1 HRS	77	0	
BIASED MOISTURE (BATTERY)		60C/90% R.H., BATTERY BIAS	1000 HRS	77	0	
FLUX DIP & H2O RINSE	0452	JESD22-A113	1 HRS	77	0	
BIASED MOISTURE (BATTERY)		60C/90% R.H., BATTERY BIAS	1000 HRS	77	0	
Total:					0	0

Assembly Information:

Assembly Site: Dallas
 Pin Count: 256
 Package Type: Single Piece BGA Module w/Battery & Crystal
 Body Size: 27x27x7.9
 Mold Compound: n/a
 Lead Frame: PCB; BT
 Lead Finish: SnPb Ball
 Die Attach: n/a
 Bond Wire / Size: Au / 1.0 mil
 Flammability: UL 94-V0
 Moisture Sensitivity (JEDEC J-STD20A) Level 3
 Date Code Range: 0512 to 0512

CONSTRUCTION ANALYSIS

DESCRIPTION	DATE CD	CONDITION	READPOINT	QTY	FAILS	FA#
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PACKAGE, ASSEMBLY PROCESS	0512	TO BE DONE BY F/A	2	3	0	30034482
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Total: 0

PACKAGE TESTS

DESCRIPTION	DATE CD	CONDITION	READPOINT	QTY	FAILS	FA#
X-RAY	0512	MIL-STD-883-2012 : TOP & SIDE VIEW		6	0	
PHYSICAL DIMENSIONS		JESD22-B100		6	0	
MARK PERMANENCY		JESD22-B107		6	0	
BALL SHEAR		JESD22-B117		6	0	
EXTERNAL VISUAL		JESD22-B101		6	0	

Total: 0

PRECONDITIONING LEVEL 3

DESCRIPTION	DATE CD	CONDITION	READPOINT	QTY	FAILS	FA#
STORAGE LIFE	0512	125C	48 HRS	231		
MOISTURE SOAK		30C/60% R.H.	192 HRS	231		
CONVECTION REFLOW		220C +5/-0C	2 PASS	231	0	
GROSS LEAK		25 C, AIR PRESSURE DECAY		231	0	
EXTERNAL VISUAL		JESD22-B101		231	0	

Total: 0

STORAGE LIFE

DESCRIPTION	DATE CD	CONDITION	READPOINT	QTY	FAILS	FA#
STORAGE LIFE	0512	85 C	1000 HRS	77	0	

Total: 0

TEMPERATURE CYCLE

DESCRIPTION	DATE CD	CONDITION	READPOINT	QTY	FAILS	FA#
TEMP CYCLE	0512	-40 TO 85C	1000 CYS	77	0	

Total: 0

TEMPERATURE HUMIDITY BIAS

DESCRIPTION	DATE CD	CONDITION	READPOINT	QTY	FAILS	FA#
FLUX DIP & H2O RINSE	0512	JESD22-A113	1 HRS	77	0	
BIASED MOISTURE (BATTERY)		60C/90% R.H., BATTERY BIAS	1000 HRS	77	0	

Total: 0

The single 1 MEG SRAM 3V failure (on page 2) was analyzed by the supplier and found to be the result of a particle defect.