

RELIABILITY REPORT  
FOR

**DS1869, Rev A3**

**Dallas Semiconductor**

4401 South Beltwood Parkway  
Dallas, TX 75244-3292

Prepared by:

*Ken Wendel*

**Ken Wendel**  
Reliability Engineering Manager  
Dallas Semiconductor  
4401 South Beltwood Pkwy.  
Dallas, TX 75244-3292  
Email : [ken.wendel@dalsemi.com](mailto:ken.wendel@dalsemi.com)  
ph: 972-371-3726  
fax: 972-371-6016  
mbl: 214-435-6610

**Conclusion:**

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

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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>.

**Device Description:**

A description of this device can be found in the product data sheet. You can find the product data sheet at [http://dbserv.maxim-ic.com/l\\_datasheet3.cfm](http://dbserv.maxim-ic.com/l_datasheet3.cfm).

**Reliability Derating:**

The Arrhenius model will be used to determine the acceleration factor for failure mechanisms that are temperature accelerated.

$$AfT = \exp((Ea/k) * (1/Tu - 1/Ts)) = tu/ts$$

AfT = Acceleration factor due to Temperature  
tu = Time at use temperature (e.g. 55°C)  
ts = Time at stress temperature (e.g. 125°C)  
k = Boltzmann's Constant (8.617 x 10<sup>-5</sup> eV/°K)  
Tu = Temperature at Use (°K)  
Ts = Temperature at Stress (°K)  
Ea = Activation Energy (e.g. 0.7 ev)

The activation energy of the failure mechanism is derived from either internal studies or industry accepted standards, or activation energy of 0.7ev will be used whenever actual failure mechanisms or their activation energies are unknown. All deratings will be done from the stress ambient temperature to the use ambient temperature.

An exponential model will be used to determine the acceleration factor for failure mechanisms, which are voltage accelerated.

$$AfV = \exp(B * (Vs - Vu))$$

AfV = Acceleration factor due to Voltage  
Vs = Stress Voltage (e.g. 7.0 volts)  
Vu = Maximum Operating Voltage (e.g. 5.5 volts)  
B = Constant related to failure mechanism type (e.g. 1.0, 2.4, 2.7, etc.)

The Constant, B, related to the failure mechanism is derived from either internal studies or industry accepted standards, or a B of 1.0 will be used whenever actual failure mechanisms or their B are unknown. All deratings will be done from the stress voltage to the maximum operating voltage. Failure rate data from the operating life test is reported using a Chi-Squared statistical model at the 60% or 90% confidence level (Cf).

The failure rate, Fr, is related to the acceleration during life test by:

$$Fr = X / (ts * AfV * AfT * N * 2)$$

X = Chi-Sq statistical upper limit  
N = Life test sample size

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

$$MTTF = 1/Fr$$

NOTE: MTTF is frequently used interchangeably with MTBF.

The calculated failure rate for this device/process is:

**FAILURE RATE:**                      **MTTF (YRS): 48294**                      **FITS: 2.4**

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

**Cf: 60%**                      **Ea: 0.7**                      **B: 0**                      **Tu: 25 °C**                      **Vu: 5.5 Volts**

The reliability data follows. At the start of this data is the device information. Following this is the assembly information. This section includes a description of the assembly vehicle used to generate this reliability data. The next section is the detailed reliability data for each stress. If there are additional assemblies used as part of this report, a description of each will follow which includes the respective reliability data for that assembly. The reliability data section includes the latest data available.

**Device Information:**

Process: 1P, 1M, 1.2um,E2PROM,N&PdeplUVII,SBC Vt,noHVNchs,T  
 Passivation: Passivation w/Nov TEOS Oxide-Nitride  
 Die Size: 97 x 99  
 Number of Transistors: 3917  
 Interconnect: Aluminum / 1% Silicon / 0.5% Copper  
 Gate Oxide Thickness: 225 Å

**OPERATING LIFE**

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
HIGH VOLTAGE LIFE	9825	125C, 7.0 VOLTS	1000 HRS	116	0
HIGH VOLTAGE LIFE	9844	125C, 7.0 V & -4.0 V	1000 HRS	179	0
HIGH VOLTAGE LIFE	9829	125C, 7.0 VOLTS	1000 HRS	116	0

**STORAGE LIFE**

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
STORAGE LIFE	9844	150C	1000 HRS	76	0
STORAGE LIFE	9836	150C	1000 HRS	136	0

**WRITE CYCLE STRESS**

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
WRITE CYCLE STRESS	9844	85 C, 6.0 V (PSA); -5.5V (PSB)	12 KCYS	77	0
WRITE CYCLE STRESS	9836	85 C, 7.0 VOLTS	25 KCYS	136	0

**Assembly Information:**

Assembly Site: Hana  
 Pin Count: 8  
 Package Type: SOIC  
 Body Size: 208x1.9  
 Mold Compound: Sumitomo 6600C  
 Lead Frame: Stamped Copper CDA194  
 Lead Finsh: SnPb Plate  
 Die Attach: 84-1 LMISR4 Epoxy Silverfilled Ablebond

Bond Wire / Size: Au / 1.0 mil  
 Flammability: UL 94-V0  
 Moisture Sensitivity (JEDEC J-STD20A) Level 1  
 Date Code Range: 0146 to 0147

**CONSTRUCTION ANALYSIS**

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
CONSTRUCTION ANALY	0147	TO BE DONE BY F/A		3	0
				<b>Total:</b>	<b>0</b>

**MOISTURE SENSITIVITY LEVEL 1**

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
EXTERNAL VISUAL	0146	J-STD-020, 6.1a		8	0
ULTRASOUND		J-STD-020		8	0
STORAGE LIFE		125C	24 HRS	8	
MOISTURE SOAK		85 C/85% R.H.	168 HRS	8	
CONVECTION REFLOW		235C	3 PASS	8	0
PRECONDITION U/S		J-STD-020		8	0
EXTERNAL VISUAL		J-STD-020, 6.1a		8	0
EXTERNAL VISUAL	0147	JESD22-B101		8	0
ULTRASOUND		J-STD-020		8	0
STORAGE LIFE		125C	24 HRS	8	
MOISTURE SOAK		85 C/85% R.H.	168 HRS	8	
CONVECTION REFLOW		235C	3 PASS	8	0
PRECONDITION U/S		J-STD-020		8	0
EXTERNAL VISUAL		J-STD-020, 6.1a		8	0
EXTERNAL VISUAL	0147	JESD22-B101		8	0
ULTRASOUND		J-STD-020		8	0
STORAGE LIFE		125C	24 HRS	8	
MOISTURE SOAK		85 C/85% R.H.	168 HRS	8	
CONVECTION REFLOW		235C	3 PASS	8	0
PRECONDITION U/S		J-STD-020		8	0
EXTERNAL VISUAL		J-STD-020, 6.1a		8	0
				<b>Total:</b>	<b>0</b>

**OPERATING LIFE**

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
HIGH VOLTAGE LIFE	0146	125C, 6.0 VOLTS	1000 HRS	80	0
HIGH VOLTAGE LIFE	0147	125C, 7.0 VOLTS	1000 HRS	80	0
HIGH VOLTAGE LIFE	0147	125C, 7.0 VOLTS	1000 HRS	80	0
				<b>Total:</b>	<b>0</b>

**PACKAGE TESTS**

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
SOLDERABILITY	0146	JESD22-B102		3	0
X-RAY	0146	MIL-STD-883-2012 : TOP & SIDE VIEW		6	0
PHYSICAL DIMENSIONS		JESD22-B100		6	0
MARK PERMANENCY		JESD22-B107		6	0

LEAD INTEGRITY	0146	JESD22-B105 TEST CONDITION B		6	0
SOLDERABILITY	0147	JESD22-B102		3	0
X-RAY	0147	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 TEST CONDITION B		6	0
SOLDERABILITY	0147	JESD22-B102		3	0
X-RAY	0147	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 TEST CONDITION B		6	0
<b>Total:</b>				<b>6</b>	<b>0</b>

### PRECONDITIONING LEVEL 1

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
STORAGE LIFE	0146	125C	24 HRS	311	
MOISTURE SOAK		85 C/85% R.H.	168 HRS	311	
CONVECTION REFLOW		235C	3 PASS	311	0
STORAGE LIFE	0147	125C	24 HRS	311	
MOISTURE SOAK		85 C/85% R.H.	168 HRS	311	
CONVECTION REFLOW		235C	3 PASS	311	0
STORAGE LIFE	0147	125C	24 HRS	311	
MOISTURE SOAK		85 C/85% R.H.	168 HRS	311	
CONVECTION REFLOW		235C	3 PASS	311	0
<b>Total:</b>				<b>0</b>	<b>0</b>

### TEMPERATURE CYCLE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
TEMP CYCLE	0146	-55C TO 125C	1000 CYS	77	0
TEMP CYCLE	0147	-55C TO 125C	1000 CYS	77	0
TEMP CYCLE	0147	-55C TO 125C	1000 CYS	77	0
<b>Total:</b>				<b>0</b>	<b>0</b>

### TEMPERATURE HUMIDITY BIAS

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
HAST	0146	130C, 85%R.H.,5.5V	96 HRS	77	0
BIASED MOISTURE	0147	85/85, 5.5 VOLTS	959 HRS	77	0
BIASED MOISTURE	0147	85/85, 5.5 VOLTS	959 HRS	77	0
<b>Total:</b>				<b>0</b>	<b>0</b>

### UNBIASED MOISTURE RESISTANCE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
AUTOCLAVE	0146	121C, 2 ATM STEAM, UNBIASED	168 HRS	77	0
AUTOCLAVE	0147	121C, 2 ATM STEAM, UNBIASED	168 HRS	75	0
AUTOCLAVE	0147	121C, 2 ATM STEAM, UNBIASED	168 HRS	77	0
<b>Total:</b>				<b>0</b>	<b>0</b>

**FAILURE RATE:**

**MTTF (YRS): 48294**

**FITS: 2.4**