

RELIABILITY REPORT  
FOR

**DS2176, Rev D4**

**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:

DS2176, Rev D4

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): 91938**                      **FITS: 1.2**

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. The next section is the detailed reliability data for each stress. The reliability data section includes the latest data available and may contain some generic data.

**Device Information:**

Process: 1P, 1M, 2.0um, Pfield, WJ BPSG  
 Passivation: Passivation w/Nitride  
 Die Size: 104 x 199  
 Number of Transistors: 0  
 Interconnect: Aluminum / 1% Silicon / 0.5% Copper  
 Gate Oxide Thickness: 250 Å

**OPERATING LIFE**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
INFANT LIFE	9643		125C, 7.0 VOLTS	48 HRS	229	0	
HIGH VOLTAGE LIFE	9643		125C, 7.0 VOLTS	1000 HRS	77	0	
INFANT LIFE	9712		125C, 7.0 VOLTS	48 HRS	231	0	
HIGH VOLTAGE LIFE	9712		125C, 7.0 VOLTS	1000 HRS	77	0	
INFANT LIFE	9745		125C, 7.0 VOLTS	48 HRS	234	0	
HIGH VOLTAGE LIFE	9745		125C, 7.0 VOLTS	1000 HRS	77	0	
INFANT LIFE	9811		125C, 7.0 VOLTS	48 HRS	234	0	
HIGH VOLTAGE LIFE	9811		125C, 7.0 VOLTS	1000 HRS	77	0	
INFANT LIFE	9838		125C, 7.0 VOLTS	48 HRS	234	0	
HIGH VOLTAGE LIFE	9838		125C, 7.0 VOLTS	1000 HRS	77	0	
INFANT LIFE	0001		125C, 7.0 VOLTS	48 HRS	234	0	
HIGH VOLTAGE LIFE	0001		125C, 7.0 VOLTS	1000 HRS	77	0	
INFANT LIFE	0042		125C, 7.0 VOLTS	48 HRS	234	0	
HIGH VOLTAGE LIFE	0042		125C, 7.0 VOLTS	1000 HRS	77	0	
INFANT LIFE	0046		125C, 7.0 VOLTS	48 HRS	233	0	
HIGH VOLTAGE LIFE	0046		125C, 7.0 VOLTS	1000 HRS	77	0	
HIGH VOLTAGE LIFE	0050		125C, 7.0 VOLTS	1000 HRS	77	0	
<b>Total:</b>						<b>0</b>	

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**TEMPERATURE CYCLE**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
TEMP CYCLE	9643		-55C TO 125C	1000 CYS	36	0	
TEMP CYCLE	9712		-55C TO 125C	1000 CYS	39	0	
TEMP CYCLE	9745		-55C TO 125C	1000 CYS	40	0	
TEMP CYCLE	9811		-55C TO 125C	1000 CYS	40	0	
TEMP CYCLE	9838		-55C TO 125C	1000 CYS	40	0	
TEMP CYCLE	0001		-55C TO 125C	1100 CYS	40	0	
TEMP CYCLE	0042		-55C TO 125C	1000 CYS	40	0	
TEMP CYCLE	0046		-55C TO 125C	1000 CYS	40	0	
TEMP CYCLE	0050		-55C TO 125C	1000 CYS	40	0	
				<b>Total:</b>		<b>0</b>	

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**TEMPERATURE HUMIDITY BIAS**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
BIASED MOISTURE	9643		85/85, 5.5 VOLTS	959 HRS	77	0	
BIASED MOISTURE	9712		85/85, 5.5 VOLTS	959 HRS	77	0	
BIASED MOISTURE	9745		85/85, 5.5 VOLTS	959 HRS	77	0	
BIASED MOISTURE	9811		85/85, 5.5 VOLTS	959 HRS	77	0	
BIASED MOISTURE	9838		85/85, 5.5 VOLTS	959 HRS	77	0	
BIASED MOISTURE	0001		85/85, 5.5 VOLTS	959 HRS	77	0	
BIASED MOISTURE	0042		85/85, 5.5 VOLTS	959 HRS	77	0	
BIASED MOISTURE	0046		85/85, 5.5 VOLTS	959 HRS	77	0	
BIASED MOISTURE	0050		85/85, 5.5 VOLTS	959 HRS	77	0	
				<b>Total:</b>		<b>0</b>	

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**UNBIASED MOISTURE RESISTANCE**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
AUTOCLAVE	9643		121C, 2 ATM STEAM, UNBIASED	96 HRS	38	0	
AUTOCLAVE	9712		121C, 2 ATM STEAM, UNBIASED	96 HRS	38	0	
AUTOCLAVE	9745		121C, 2 ATM STEAM, UNBIASED	96 HRS	40	0	
AUTOCLAVE	9811		121C, 2 ATM STEAM, UNBIASED	96 HRS	40	0	
AUTOCLAVE	9838		121C, 2 ATM STEAM, UNBIASED	96 HRS	40	0	
AUTOCLAVE	0001		121C, 2 ATM STEAM, UNBIASED	96 HRS	40	0	
AUTOCLAVE	0042		121C, 2 ATM STEAM, UNBIASED	96 HRS	40	0	
AUTOCLAVE	0046		121C, 2 ATM STEAM, UNBIASED	96 HRS	39	0	
AUTOCLAVE	0050		121C, 2 ATM STEAM, UNBIASED	96 HRS	40	0	
				<b>Total:</b>		<b>0</b>	

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**FAILURE RATE:****MTTF (YRS): 91938****FITS: 1.2**