

RELIABILITY REPORT  
FOR

**DS1000, Rev E3**

**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:

DS1000, Rev E3

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): 28334**                      **FITS: 4.0**

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.

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**Device Information:**

Process: 1P, 1M, 1.2um, Ndepletion, TEOS SP, WJ BPSG,  
 Passivation: Laser/Nit - Pass/Nit - General LaserPrb  
 Die Size: 83 x 71  
 Number of Transistors: 677  
 Interconnect: Aluminum / 1% Silicon / 0.5% Copper  
 Gate Oxide Thickness: 225 Å

**OPERATING LIFE**

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
HIGH VOLTAGE LIFE	9420	125C, 7.0 VOLTS	1000 HRS	153	0
INFANT LIFE	0033	125C, 7.0 VOLTS	48 HRS	232	0
HIGH VOLTAGE LIFE	0033	125C, 7.0 VOLTS	1000 HRS	77	0
<b>Total:</b>					<b>0</b>

**TEMPERATURE CYCLE**

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
TEMP CYCLE	0033	-55C TO 125C	1000 CYS	40	0
<b>Total:</b>					<b>0</b>

**TEMPERATURE HUMIDITY BIAS**

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
BIASED MOISTURE	9420	85/85, 5.5 VOLTS	959 HRS	77	0
BIASED MOISTURE	0033	85/85, 5.5 VOLTS	959 HRS	77	0
<b>Total:</b>					<b>0</b>

**UNBIASED MOISTURE RESISTANCE**

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
AUTOCLAVE	0033	121C, 2 ATM STEAM, UNBIASED	96 HRS	38	0
<b>Total:</b>					<b>0</b>

**FAILURE RATE:**                      **MTTF (YRS): 28334**                      **FITS: 4.0**