



12/19/2008

**PRODUCT RELIABILITY REPORT  
FOR**

**DS1620, Rev E3**

**Maxim Integrated Products**

**4401 South Beltwood Parkway  
Dallas, TX 75244-3292**

**Prepared by:**

**Don Lipps  
Manager, Reliability Engineering  
Maxim Integrated Products  
4401 South Beltwood Pkwy.  
Dallas, TX 75244-3292  
Email: don.lipps@maxim-ic.com  
ph: 972-371-3739  
fax: 972-371-6016**

**Conclusion:**

The following qualification successfully meets the quality and reliability standards required of all Maxim products:

DS1620, Rev E3

In addition, Maxim'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:

<b>FAILURE RATE:</b>	<b>MTTF (YRS):</b>	<b>76352</b>	<b>FITS:</b>	<b>1.5</b>
	<b>DEVICE HOURS:</b>	<b>649784</b>	<b>FAILS:</b>	<b>0</b>

Only data from Operating Life or similar stresses are used for this calculation.

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. "\*" after DATE CODE denotes specific product data and SEQ No. to identify specific line items in the report for comments when required.

#### Device Information:

Process: E6WA-2P2M,HPVt,E2,EPROGVt,TCN1,PF ALOCOS:GOI  
 Passivation: Passivation w/Nov TEOS Oxide-Nitride  
 Die Size: 71 x 54  
 Number of Transistors: 9279  
 Interconnect: Aluminum / 0.5% Copper  
 Gate Oxide Thickness: 150 Å

#### ELECTRICAL CHARACTERIZATION

DESCRIPTION	DATE CODE/SEQ	CONDITION	READPOINT	QTY	FAILS	FA#
ESD SENSITIVITY	0842 * 1	EOS/ESD S5.1 HBM 500 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0842 * 2	EOS/ESD S5.1 HBM 1000 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0842 * 3	EOS/ESD S5.1 HBM 2000 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0842 * 4	EOS/ESD S5.1 HBM 3000 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0842 * 5	EOS/ESD S5.1 HBM 8000 VOLTS	1 PUL'S	3	2	No FA
LATCH-UP	0842 * 6	JESD78, I-TEST 125C		6	0	
LATCH-UP	0842 * 7	JESD78, V-SUPPLY TEST 125C		6	0	
Total:					2	

#### OPERATING LIFE

DESCRIPTION	DATE CODE/SEQ	CONDITION	READPOINT	QTY	FAILS	FA#
HIGH TEMP OP LIFE	0635	125C, 5.5 VOLTS	1000 HRS	77	0	
HIGH TEMP OP LIFE	0645	125C, 5.5 VOLTS	1000 HRS	77	0	
HIGH TEMP OP LIFE	0718	125C, 5.25 VOLTS	1000 HRS	45	0	
HIGH TEMP OP LIFE	0718	125C, 5.25 VOLTS	1000 HRS	45	0	
HIGH TEMP OP LIFE	0721	125C, 5.5 VOLTS	1000 HRS	80	0	

HIGH TEMP OP LIFE	0738	125C, 5.5 VOLTS	1000 HRS	77	0
HIGH TEMP OP LIFE	0751	125C, 5.5 VOLTS	1000 HRS	80	0
HIGH TEMP OP LIFE	0802	125C, 5.5 V (PSA) & 15.0 V (PSB)	1000 HRS	77	0
HIGH TEMP OP LIFE	0802	125C, 5.5 V (PSA) & 15.0 V (PSB)	1000 HRS	77	0
HIGH TEMP OP LIFE	0842	* 1 125C, 5.5 VOLTS	192 HRS	77	0
<b>Total:</b>				<b>0</b>	

#### W/E ENDURANCE AND DATA RET'N

DESCRIPTION	DATE CODE/SEQ	CONDITION	READPOINT	QTY	FAILS	FA#
WRITE CYCLE STRESS (KCYS)	0635	85 C, 5.5 VOLTS	30 KCYS	77	0	
STORAGE LIFE	0635	150C	1000 HRS	77	0	
WRITE CYCLE STRESS (KCYS)	0635	25 C, 5.5 VOLTS	50 KCYS	77	0	
STORAGE LIFE	0635	150C	1000 HRS	77	0	
WRITE CYCLE STRESS (KCYS)	0709	25 C, 5.5 VOLTS	200 KCYS	77	0	
STORAGE LIFE	0709	150C	1000 HRS	77	0	
STORAGE LIFE	0718	150C	1000 HRS	77	0	
WRITE CYCLE STRESS (KCYS)	0738	25 C, 5.5 VOLTS	200 KCYS	77	0	
STORAGE LIFE	0738	150C	1000 HRS	77	0	
WRITE CYCLE STRESS (KCYS)	0802	25 C, 5.5 V (PSA) & 15.0 V (PSB)	200 KCYS	77	0	
STORAGE LIFE	0802	150C	1000 HRS	72	0	
WRITE CYCLE STRESS (KCYS)	0802	85 C, 5.5 V (PSA) & 15.0 V (PSB)	50 KCYS	77	0	
STORAGE LIFE	0802	150C	1000 HRS	77	0	
WRITE CYCLE STRESS (KCYS)	0802	85 C, 5.5 V (PSA) & 15.0 V (PSB)	50 KCYS	77	0	
STORAGE LIFE	0802	150C	1000 HRS	77	0	
WRITE CYCLE STRESS (KCYS)	0842	* 2 85 C, 5.5 VOLTS	20 KCYS	77	0	
STORAGE LIFE	0842	* 2 150C	96 HRS	77	0	
<b>Total:</b>				<b>0</b>		

<b>FAILURE RATE:</b>	<b>MTTF (YRS):</b>	<b>76352</b>	<b>FITS:</b>	<b>1.5</b>
	<b>DEVICE HOURS:</b>	<b>649784</b>	<b>FAILS:</b>	<b>0</b>