



9/30/2009

**PRODUCT RELIABILITY REPORT
FOR**

DS1500, Rev A4

Maxim Integrated Products

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

Prepared by:

**Ken Wendel
Director, Reliability Engineering
Maxim Integrated Products
4401 South Beltwood Pkwy.
Dallas, TX 75244-3292
Email : ken.wendel@maxim-ic.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 Maxim products:

DS1500, Rev A4

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.

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 10⁻⁵ 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):** **210116** **FITS:** **0.5**
DEVICE HOURS: **1686541252** **FAILS:** **0**

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. **Bold** Product Number denotes specific product data.

Device Information:

Process: E6N-1P2M,LLVt,ND cap ALOCOS:GOI
 Passivation: Passivation w/Nov TEOS Oxide-Nitride
 Die Size: 140 x 145
 Number of Transistors: 38500
 Interconnect: Aluminum / 0.5% Copper
 Gate Oxide Thickness: 150 Å

ELECTRICAL CHARACTERIZATION

DESCRIPTION	DATE CODE/PRODUCT/LOT	CONDITION	READPOIN	QTY	FAILS	FA#
ESD SENSITIVITY	0303 DS1500	ZN320013CA EOS/ESD S5.1 HBM 500 VOLTS	1		0	
ESD SENSITIVITY	0303 DS1500	ZN320013CA EOS/ESD S5.1 HBM 1000 VOLTS	1		0	
ESD SENSITIVITY	0303 DS1500	ZN320013CA EOS/ESD S5.1 HBM 2000 VOLTS	1		0	
ESD SENSITIVITY	0303 DS1500	ZN320013CA EOS/ESD S5.1 HBM 4000 VOLTS	1		3	No FA
ESD SENSITIVITY	0303 DS1500	ZN320013CA EOS/ESD S5.1 HBM 8000 VOLTS	1		3	No FA
LATCH-UP	0303 DS1500	ZN320013CA JESD78, I-TEST 125C		6	0	
LATCH-UP	0303 DS1500	ZN320013CA JESD78, V-SUPPLY TEST 125C		6	0	
Total:					6	

LOW TEMPERATURE OPERATING LIFE

DESCRIPTION	DATE CODE/PRODUCT/LOT	CONDITION	READPOIN	QTY	FAILS	FA#
BIASED BAKE	9821 DS1743	ZL743176BA -20C, 6.0 VOLTS	1000 HRS	77	0	
Total:					0	

OPERATING LIFE

DESCRIPTION	DATE CODE	PRODUCT/LOT	CONDITION	READPOIN	QTY	FAILS	FA#
INFANT LIFE	9821	DS1743	ZL743176BA 125C, 6.0 VOLTS	48 HRS	429	0	
HIGH VOLTAGE LIFE	9821	DS1743	ZL743176BA 125C, 6.0 VOLTS	1500 HRS	153	0	
HIGH VOLTAGE LIFE	9908	DS1543	ZL844441AA 125C, 6.0 VOLTS	1000 HRS	256	0	
HIGH VOLTAGE LIFE	0004	DS1501	DL922802AE 125C, 6.0 VOLTS	1000 HRS	256	0	
HIGH VOLTAGE LIFE	0303	DS1501	ZN317852CA 125C, 6.0 VOLTS	1000 HRS	77	0	
HIGH VOLTAGE LIFE	0303	DS1500	ZN320013CA 125C, 6.0 VOLTS	1000 HRS	77	0	
HIGH TEMP OP LIFE	0324	DS1743	ZJ339017AB 125C, 5.5 VOLTS	988 HRS	77	0	
HIGH TEMP OP LIFE	0324	DS1558	ZN334003CB 125C, 5.5 VOLTS	1000 HRS	77	0	
HIGH TEMP OP LIFE	0324	DS1553	ZJ339015CB 125C, 5.5 VOLTS	1000 HRS	77	0	
HIGH TEMP OP LIFE	0427	DS1553	ZR426525AB 125C, 5.5 VOLTS	1000 HRS	77	0	
HIGH TEMP OP LIFE	0429	DS1501	ZR433107AA 125C, 5.5 VOLTS	1000 HRS	77	0	
HIGH TEMP OP LIFE	0429	DS1501	ZR433107AC 125C, 5.5 VOLTS	1000 HRS	77	0	
HIGH TEMP OP LIFE	0432	DS1501	ZJ416108AB 125C, 5.5 VOLTS	1000 HRS	77	0	
HIGH TEMP OP LIFE	0433	DS1553	ZJ426525AD 125C, 5.5 VOLTS	1000 HRS	45	0	
HIGH TEMP OP LIFE	0433	DS1501	ZJ414103AB 125C, 5.5 VOLTS	1000 HRS	77	0	
HIGH TEMP OP LIFE	0434	DS1643	DJ229526AA 125C, 5.0 VOLTS	1000 HRS	77	0	
HIGH TEMP OP LIFE	0502	DS1501	ZE515105AE 125C, 5.0 VOLTS	1000 HRS	45	0	
HIGH TEMP OP LIFE	0502	DS1501	ZE515105AF 125C, 5.0 VOLTS	1000 HRS	45	0	
HIGH TEMP OP LIFE	0502	DS1501	ZE515105AG 125C, 5.0 VOLTS	1000 HRS	45	0	

Total: 0

FAILURE RATE: MTTF (YRS): 210116 FITS: 0.5
DEVICE HOURS: 1686541252 FAILS: 0