



8/26/2008

**PRODUCT RELIABILITY REPORT  
FOR**

**DS2784, Rev A4**

**Maxim Integrated Products**

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

**Prepared by:**

**Don Lipps  
Staff Reliability Engineer  
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:

DS2784, 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](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:

$$\text{MTTF} = 1/\text{Fr}$$

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>81715</b>	<b>FITS:</b>	<b>1.4</b>
	<b>DEVICE HOURS:</b>	<b>695424</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:

<b>Cf: 60%</b>	<b>Ea: 0.7</b>	<b>B: 0</b>	<b>Tu: 25 °C</b>	<b>Vu: 4.6 Volts</b>
----------------	----------------	-------------	------------------	----------------------

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:	E35XG- 3P3M,GOI,DPE2,CrSi,DSD,PDES,PDRES,Cap,ENPN,DPT,HTO,S
Passivation:	TEOS Ox-Nit Passivation for E35X; Full BEOL at SA; PT only in Dallas
Die Size:	98 x 129
Number of Transistors:	170939
Interconnect:	Aluminum / 0.5% Copper
Gate Oxide Thickness:	120 Å

#### ELECTRICAL CHARACTERIZATION

DESCRIPTION	DATE CODE/SEQ	CONDITION	READPOINT	QTY	FAILS	FA#
ESD SENSITIVITY	0826 * 1	EOS/ESD S5.1 HBM 500 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0826 * 2	EOS/ESD S5.1 HBM 1000 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0826 * 3	EOS/ESD S5.1 HBM 2000 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0826 * 4	EOS/ESD S5.1 HBM 3000 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0826 * 5	EOS/ESD S5.1 HBM 4000 VOLTS	1 PUL'S	3	0	
LATCH-UP	0826 * 6	JESD78, I-TEST 125C		6	0	
LATCH-UP	0826 * 7	JESD78, V-SUPPLY TEST 125C		6	0	
Total:					0	

#### OPERATING LIFE

DESCRIPTION	DATE CODE/SEQ	CONDITION	READPOINT	QTY	FAILS	FA#
HIGH TEMP OP LIFE	0640	125C, 5.5 VOLTS	1000 HRS	45	0	
HIGH TEMP OP LIFE	0642	125C, 5.5 VOLTS	1000 HRS	45	0	
HIGH TEMP OP LIFE	0714	125C, 5.5 V (PSA) & 15.0 V (PSB)	1000 HRS	77	0	
HIGH TEMP OP LIFE	0723	125C, 5.5 VOLTS	1000 HRS	45	0	

HIGH TEMP OP LIFE	0727	125C, 5.5 VOLTS	1000 HRS	77	0
HIGH TEMP OP LIFE	0732	125C, 5.5 V (PSA) & 15.0 V (PSB)	1000 HRS	77	0
HIGH TEMP OP LIFE	0736	125C, 5.5 VOLTS	1000 HRS	77	0
HIGH TEMP OP LIFE	0744	125C, 5.5 VOLTS	1000 HRS	77	0
HIGH TEMP OP LIFE	0749	125C, 5.5 VOLTS	1000 HRS	75	0
HIGH TEMP OP LIFE	0804	125C, 5.5 VOLTS	1000 HRS	77	0
HIGH TEMP OP LIFE	0824	125C, 5.5 VOLTS	192 HRS	45	0
HIGH TEMP OP LIFE	0826	* 1 125C, 5.5 V (PSA) & 15.0 V (PSB)	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)	0640	70 C, 5.5 VOLTS	50 KCYS	77	0	
STORAGE LIFE	0640	150C	1000 HRS	77	0	
WRITE CYCLE STRESS (KCYS)	0642	50 C, 5.5 VOLTS (PSA), 15.0 VOLTS (PSB)	10 KCYS	77	0	
STORAGE LIFE	0642	150C	1000 HRS	77	0	
WRITE CYCLE STRESS (KCYS)	0642	50 C, 5.5 VOLTS (PSA), 15.0 VOLTS (PSB)	1 KCYS	77	0	
STORAGE LIFE	0642	150C	1000 HRS	77	0	
WRITE CYCLE STRESS (CYS)	0642	50 C, 5.5 VOLTS (PSA), 15.0 VOLTS (PSB)	100 CYS	77	0	
STORAGE LIFE	0642	150C	1000 HRS	77	0	
WRITE CYCLE STRESS (KCYS)	0714	50 C, 5.5 V (PSA) & 15.0 V (PSB)	50 KCYS	77	0	
STORAGE LIFE	0714	150C	1000 HRS	77	0	
WRITE CYCLE STRESS (KCYS)	0732	50 C, 5.5 V (PSA) & 15.0 V (PSB)	50 KCYS	77	0	
STORAGE LIFE	0732	150C	1000 HRS	77	0	
WRITE CYCLE STRESS (KCYS)	0736	50 C, 5.5 VOLTS	50 KCYS	77	0	
STORAGE LIFE	0736	150C	1000 HRS	77	0	
WRITE CYCLE STRESS (CYS)	0824	50 C, 5.5 VOLTS (PSA), 15.0 VOLTS (PSB)	100 CYS	77	0	
STORAGE LIFE	0824	150C	96 HRS	77	0	
WRITE CYCLE STRESS (KCYS)	0826	* 2 50 C, 5.5 V (PSA) & 15.0 V (PSB)	50 KCYS	77	0	
STORAGE LIFE	0826	* 2 150C	96 HRS	77	0	
<b>Total:</b>					<b>0</b>	

<b>FAILURE RATE:</b>	<b>MTTF (YRS):</b>	<b>81715</b>	<b>FITS:</b>	<b>1.4</b>
	<b>DEVICE HOURS:</b>	<b>695424</b>	<b>FAILS:</b>	<b>0</b>