



3/29/2010

**PRODUCT RELIABILITY REPORT  
FOR**

**DS3644, Rev A3**

**Maxim Integrated Products**

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**Conclusion:**

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

DS3644, Rev A3

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:

**FAILURE RATE:**                      **MTTF (YRS):**            **103071**      **FITS:**            **1.1**  
**DEVICE HOURS:**    **827321919**    **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: 3.6** 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: SA E35X-0.5um, 5V CMOS with embedded Array EEPROM, embedded RSE EEPROM, 18V CMOS, VNP, P2-P1 Cap, LVMOSCAP, HVMOSCAP, Varactor Cap, CrSi R's & Laser Fuses, 3LM.  
 Passivation: TEOS Oxide-Nitride Passivation  
 Die Size: 187 x 155  
 Number of Transistors: 142536  
 Interconnect: Aluminum / 0.5% Copper  
 Gate Oxide Thickness: 120 Å

**ESD HBM**

DESCRIPTION	DATE	CODE/PRODUCT/LOT	CONDITION	READPOIN	QTY	FAILS	FA#
ESD SENSITIVITY	1004	<b>DS3644</b>	WS046549D JESD22-A114 HBM 500 VOLTS	1	PUL'S	3	0
ESD SENSITIVITY	1004	<b>DS3644</b>	WS046549D JESD22-A114 HBM 1000 VOLTS	1	PUL'S	3	0
ESD SENSITIVITY	1004	<b>DS3644</b>	WS046549D JESD22-A114 HBM 2000 VOLTS	1	PUL'S	3	0
ESD SENSITIVITY	1004	<b>DS3644</b>	WS046549D JESD22-A114 HBM 4000 VOLTS	1	PUL'S	3	0
ESD SENSITIVITY	1004	<b>DS3644</b>	WS046549D JESD22-A114 HBM 8000 VOLTS	1	PUL'S	3	3 No FA
<b>Total:</b>						<b>3</b>	

**LATCH-UP**

DESCRIPTION	DATE	CODE/PRODUCT/LOT	CONDITION	READPOIN	QTY	FAILS	FA#
LATCH-UP I	1004	<b>DS3644</b>	WS046549D JESD78A, I-TEST 125C		6	0	
LATCH-UP V	1004	<b>DS3644</b>	WS046549D JESD78A, V-SUPPLY TEST 125C		6	0	
<b>Total:</b>						<b>0</b>	

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**OPERATING LIFE**

DESCRIPTION	DATE CODE	PRODUCT/LOT	CONDITION	READPOIN	QTY	FAILS	FA#
HIGH TEMP OP LIFE	0839	DS2784	WJ942986T 125C, 4.6 V (PSA) & 15.0 V (PSB)	1000 HRS	77	0	
HIGH TEMP OP LIFE	0843	DS2784	WJ941766O 125C, 4.6 V (PSA) & 15.0 V (PSB)	1000 HRS	77	0	
HIGH TEMP OP LIFE	0848	DS2784	WJ943239LC 125C, 4.6 V (PSA) & 15.0 V (PSB)	1000 HRS	77	0	
HIGH TEMP OP LIFE	0914	DS2780	WJ944804A 125C, 5.5 VOLTS	1000 HRS	77	0	
HIGH TEMP OP LIFE	0916	DS2784	WJ943240IC 125C, 5.5 V (PSA) & 15.0 V (PSB)	1000 HRS	77	0	
HIGH TEMP OP LIFE	0916	DS2784	WJ945481A 125C, 5.5 V (PSA) & 15.0 V (PSB)	1000 HRS	77	0	
HIGH TEMP OP LIFE	0922	DS36A92	WJ946542A 125C, 3.6 VOLTS	192 HRS	45	0	
HIGH TEMP OP LIFE	0932	MAX17043	WJ946441P 125C, 4.5V (PSA) & 9.2V (PSB)	192 HRS	45	0	
HIGH TEMP OP LIFE	0933	DS1873	QJ917612BC 125C, 4.2 VOLTS	192 HRS	77	0	
HIGH TEMP OP LIFE	0937	DS2784	WJ046898JC 125C, 5.5 V (PSA) & 15.0 V (PSB)	1000 HRS	77	0	
HIGH TEMP OP LIFE	0940	DS2784	WJ048759A 125C, 5.5 V (PSA) & 15.0 V (PSB)	1000 HRS	80	0	
HIGH TEMP OP LIFE	0946	DS1876	WJ048840A 125C, 4.2 VOLTS	192 HRS	77	0	
HIGH TEMP OP LIFE	0948	DS1091L	WJ946344E 150C, 3.6 VOLTS	408 HRS	45	0	
HIGH TEMP OP LIFE	0948	DS1091L	WJ946344E 150C, 3.6 VOLTS	408 HRS	45	0	
HIGH TEMP OP LIFE	0951	DS2784	WJ049559A 125C, 5.5 V (PSA) & 15.0 V (PSB)	1000 HRS	80	0	
HIGH TEMP OP LIFE	1004	<b>DS3644</b>	WS046549D 125C, 3.6V (PSA) & 3.3V (PSB)	192 HRS	45	0	

**Total: 0**

**FAILURE RATE: MTTF (YRS): 103071 FITS: 1.1**  
**DEVICE HOURS: 827321919 FAILS: 0**