

8/6/2013



**PRODUCT RELIABILITY REPORT  
FOR**

**MAXQ1851**

**Maxim Integrated**

**14460 Maxim Dr.  
Dallas, TX 75244**

**Approved by:**

**Sokhom Chum  
MTS, Reliability Engineering**

**Conclusion:**

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

MAXQ1851

In addition, Maxim Integrated'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.maximintegrated.com/qa/reliability/monitor>.

**Device Description:**

A description of this device can be found in the product data sheet. You can find the product data sheet at <http://www.maximintegrated.com/search/parts.mvp>.

**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:

**FAILURE RATE:**                      **MTTF (YRS):**      **111389**      **FITS:**              **1.0**  
**DEVICE HOURS:**      **894085361**      **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:                      TSMC 0.18um Mixed signal, Embedded Flash, General Purpose, Two Poly Five Metal, 1.8V/3.3V Polyimide - No  
Passivation:                      SiO/SiN  
Die Size:                      166 x 166  
Number of Transistors:              4145123  
Interconnect:                      Aluminum / 0.5% Copper  
Gate Oxide Thickness:              32 Å

**ESD HBM**

DESCRIPTION	DATE	CODE/PRODUCT/LOT	CONDITION	READPOIN	QTY	FAILS	FA#
ESD SENSITIVITY	1315	<b>MAXQ1851</b>	ZX133763BB JESD22-A114 HBM 500 VOLTS	1	PUL'S	5	0
ESD SENSITIVITY	1315	<b>MAXQ1851</b>	ZX133763BB JESD22-A114 HBM 1000 VOLTS	1	PUL'S	5	0
ESD SENSITIVITY	1315	<b>MAXQ1851</b>	ZX133763BB JESD22-A114 HBM 1500 VOLTS	1	PUL'S	5	0
ESD SENSITIVITY	1315	<b>MAXQ1851</b>	ZX133763BB JESD22-A114 HBM 2000 VOLTS	1	PUL'S	5	0
ESD SENSITIVITY	1315	<b>MAXQ1851</b>	ZX133763BB JESD22-A114 HBM 2500 VOLTS	1	PUL'S	5	0
<b>Total:</b>						<b>0</b>	

**LATCH-UP**

DESCRIPTION	DATE	CODE/PRODUCT/LOT	CONDITION	READPOIN	QTY	FAILS	FA#
LATCH-UP I	1315	<b>MAXQ1851</b>	ZX133763BB JESD78A, I-TEST 25C 100mA			6	0
LATCH-UP I	1315	<b>MAXQ1851</b>	ZX133763BB JESD78A, I-TEST 25C 250mA			6	0
LATCH-UP V	1315	<b>MAXQ1851</b>	ZX133763BB JESD78A, V-SUPPLY TEST 25C			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	0814	MAXQ1103	QN089294A 125C, 3.6V (PSA) & 2.0V (PSB)	1000 HRS	77	0	
HIGH TEMP OP LIFE	0828	MAXQ2010	QK086138C 125C, 3.6 VOLTS	1000 HRS	76	0	
HIGH TEMP OP LIFE	0837	MAX2990	QN096322A 125C, 3.6V (PSA) & 2.0V (PSB)	1000 HRS	77	0	
HIGH TEMP OP LIFE	0851	MAXQ3108	QJ091011AC 125C, 3.6 VOLTS	192 HRS	73	0	
HIGH TEMP OP LIFE	0851	MAXQ610	QJ091123AB 125C, 3.6V (PSA) & 2.0V (PSB)	1000 HRS	77	0	
HIGH TEMP OP LIFE	0852	MAXQ1850	QJ091074AA 125C, 3.6 VOLTS	192 HRS	75	0	
HIGH TEMP OP LIFE	0909	MAXQ8913	NQQ8ZAD 125C, 3.6V (PSA) & 5.0V (PSB)	192 HRS	77	0	
HIGH TEMP OP LIFE	0934	MAXQ1103	QN101437A 125C, 3.6V (PSA) & 2.0V (PSB)	192 HRS	77	0	
HIGH TEMP OP LIFE	0946	MAXQ622	QN091481C 125C, 3.6V (PSA) & 5.5V (PSB)	192 HRS	77	0	
HIGH TEMP OP LIFE	1006	MAXQ1004	QS101775AB 125C, 3.6V (PSA) & 5.0V (PSB)	192 HRS	45	0	
HIGH TEMP OP LIFE	1024	MAXQ1010	QJ101790AG 125C, 5.5V (PS1) & 3.6V (PS2)	192 HRS	45	0	
HIGH TEMP OP LIFE	1024	MAX31782	QJ102013AC 125C, 5.5 VOLTS	192 HRS	45	0	
HIGH TEMP OP LIFE	1030	MAXQ613	QJ101861CH 135C, 3.6 V (PSA)	192 HRS	45	0	
HIGH TEMP OP LIFE	1050	MAXQ6831	ZN112250BC 125C, 3.6V (PSA), 1.89V (PSB) & 2.94V (PSD)	1000 HRS	48	0	
HIGH TEMP OP LIFE	1111	MAXQ618	ZJ112624AD 125C, 3.6 VOLTS	192 HRS	48	0	
HIGH TEMP OP LIFE	1119	MAXQ1740	ZJ112746BA 125C, 3.6 VOLTS	192 HRS	48	0	
HIGH TEMP OP LIFE	1120	DS4830	ZS112802AC 125C, 3.3 VOLTS	192 HRS	77	0	
HIGH TEMP OP LIFE	1134	MAXQ1050	ZS123062AB 125C, 5.5V (PSA) & 3.6V (PSB)	192 HRS	48	0	
HIGH TEMP OP LIFE	1135	MAXQ610	ZJ111435FC- 125C, 3.6V (PSA) & 2.0V (PSB)	1000 HRS	77	0	
HIGH TEMP OP LIFE	1135	MAXQ610	ZJ111435BD 125C, 3.6V (PSA) & 2.0V (PSB)	1000 HRS	77	0	
HIGH TEMP OP LIFE	1135	MAXQ610	ZJ111438BB- 125C, 3.6V (PSA) & 2.0V (PSB)	1000 HRS	77	0	
HIGH TEMP OP LIFE	1211	MAXQ615	ZS123275AE 125C, 3.6 VOLTS	192 HRS	80	0	
HIGH TEMP OP LIFE	1219	MAX34451	ZJ133319BC 125C, 3.6 VOLTS	192 HRS	80	0	
HIGH TEMP OP LIFE	1223	MAXQ1011	GW123374A 125C, 5.5V (PS1) & 3.6V (PS2)	1000 HRS	48	0	

HIGH TEMP OP LIFE	1242	MAXQ305	ZJ133525BB	125C, 3.3V (PSA), 1.5V (PSB)	192	HRS	80	0
HIGH TEMP OP LIFE	1246	MAXQ1741	ZS133574BB	125C, 3.6 VOLTS	192	HRS	48	0
HIGH TEMP OP LIFE	1310	MAXQ610	ZX133775AC	125C, 3.6 VOLTS	500	HRS	48	0
HIGH TEMP OP LIFE	1310	MAXQ610	ZX133775AD	125C, 3.6 VOLTS	500	HRS	48	0
HIGH TEMP OP LIFE	1310	MAXQ610	ZX133775AE	125C, 3.6 VOLTS	192	HRS	48	0
HIGH TEMP OP LIFE	1310	MAXQ149	ZX133838AB	125C, 3.6V (PSB) & 5.5V (PSA)	192	HRS	80	0
HIGH TEMP OP LIFE	1315	<b>MAXQ1851</b>	ZX133763BB	125C, 3.6 VOLTS	192	HRS	80	0
HIGH TEMP OP LIFE	1317	MAXQ616	ZX133909CA	125C, 3.6 VOLTS	192	HRS	48	0
HIGH TEMP OP LIFE	1317	MAXQ616	ZX133909CA	125C, 3.6 VOLTS	192	HRS	32	0

**Total: 0**

**FAILURE RATE:                    MTTF (YRS):            111389            FITS:            1.0**  
**DEVICE HOURS:        894085361        FAILS:            0**