



12/1/2011

**PRODUCT RELIABILITY REPORT  
FOR**

**DS3920**

**Maxim Integrated Products**

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**Conclusion:**

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

DS3920

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:

**FAILURE RATE:**                      **MTTF (YRS):**            **29551**            **FITS:**            **3.9**  
**DEVICE HOURS:**    **237197209**    **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:                                  Maxim SA Fab S45  
Passivation:                              15um BCB  
Die Size:                                    42 x 63  
Number of Transistors:                18000  
Interconnect:                            Aluminum / 0.5% Copper  
Gate Oxide Thickness:                 140Å

**ESD HBM**

DESCRIPTION	DATE	CODE/PRODUCT/LOT	CONDITION	READPOIN	QTY	FAILS	FA#
ESD SENSITIVITY	1105	<b>DS3920</b>	ZJ163071AB JESD22-A114 HBM 500 VOLTS	1	PUL'S	5	0
ESD SENSITIVITY	1105	<b>DS3920</b>	ZJ163071AB JESD22-A114 HBM 1000 VOLTS	1	PUL'S	5	0
ESD SENSITIVITY	1105	<b>DS3920</b>	ZJ163071AB JESD22-A114 HBM 1500 VOLTS	1	PUL'S	5	0
ESD SENSITIVITY	1105	<b>DS3920</b>	ZJ163071AB JESD22-A114 HBM 2000 VOLTS	1	PUL'S	5	0
ESD SENSITIVITY	1105	<b>DS3920</b>	ZJ163071AB 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	1105	<b>DS3920</b>	ZJ163071AB JESD78A, I-TEST 25C 100mA, 40V Supply		6	6	See Note
LATCH-UP I	1105	<b>DS3920</b>	ZJ163071AB JESD78A, I-TEST 25C 100mA, 20V Supply		6	0	
LATCH-UP V	1105	<b>DS3920</b>	ZJ163071AB JESD78A, V-SUPPLY TEST 25C		6	0	
<b>Total:</b>						<b>6</b>	

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**OPERATING LIFE**

DESCRIPTION	DATE CODE/PRODUCT/LOT	CONDITION	READPOIN	QTY	FAILS	FA#
HIGH TEMP OP LIFE	0708 DS2731	XK664400AD 125C, 4.9V (PSA) & 13.2V (PSB)	1000 HRS	45	0	
HIGH TEMP OP LIFE	0812 DS8102	QJ880400AB 125C, 3.6 VOLTS	1000 HRS	45	0	
HIGH TEMP OP LIFE	0816 DS4560	QD836692A 100C, 13.2V (PSB) & 5.5V (PSA)	1000 HRS	45	0	
HIGH TEMP OP LIFE	0819 DS2733	XJ881600BB 125C, 13.31V (PSB) & 3.5V (PSA)	1000 HRS	45	0	
HIGH TEMP OP LIFE	0835 DS8500	QJ982700AB 125C, 3.6 VOLTS	1000 HRS	45	0	
HIGH TEMP OP LIFE	0943 MAX31190	WJ051035AB 125C, 3.6 VOLTS	192 HRS	45	0	
HIGH TEMP OP LIFE	0950 MAX8990	EYGZCA004 135C, 5.0 V(PSA), 10.0V(PSB) & -3.3V(PSC)	192 HRS	45	0	
HIGH TEMP OP LIFE	1018 DS4560	WD054757A 100C, 13.2V (PSB) & 5.5V (PSA)	192 HRS	45	0	
HIGH TEMP OP LIFE	1035 MAX34561	WS154453B 125C, 13.2V (PSB) & 5.5V (PSA)	192 HRS	45	0	
HIGH TEMP OP LIFE	1105 <b>DS3920</b>	ZJ163071AB 135C, 75V (V8)	192 HRS	77	0	
HIGH TEMP OP LIFE	1111 MAX31855	ZM163058B 125C, 3.6 VOLTS	192 HRS	77	0	
HIGH TEMP OP LIFE	1113 MAX17710	ZJ156745BC 125C, 5.5 VOLTS	240 HRS	48	0	
			<b>Total:</b>		<b>0</b>	

**FAILURE RATE:                    MTTF (YRS):                    29551                    FITS:                    3.9**  
**DEVICE HOURS:                    237197209                    FAILS:                    0**

Does not pass JEDEC JESD78 testing, but does pass +/- 100mA at 20V per JEDEC test method or when pins are limited to within AMR.