

3/3/2014



**PRODUCT RELIABILITY REPORT  
FOR**

**DS1088E**

**Maxim Integrated**

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

**Approved by:**

**Sokhom Chum  
SMTS, Reliability Engineering**

**Conclusion:**

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

DS1088E

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:

$$MTTF = 1/Fr$$

NOTE: MTTF is frequently used interchangeably with MTBF.

The calculated failure rate for this device/process is:

**FAILURE RATE:**                      **MTTF (YRS):**      **256472**      **FITS:**              **0.4**  
**DEVICE HOURS:**   **2058622814**      **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, VNPN, P2-P1 Cap, LVMOSCAP, HVMOSCAP, Varactor Cap, CrSi R's & Laser Fuses, 3LM.  
 Passivation: TEOS Oxide-Nitride Passivation  
 Die Size: 51 x 52  
 Number of Transistors: 4071  
 Interconnect: Aluminum / 0.5% Copper  
 Gate Oxide Thickness: 120 Å

**ESD HBM**

DESCRIPTION	DATE	CODE/PRODUCT/LOT	CONDITION	READPOIN	QTY	FAILS	FA#
ESD SENSITIVITY	1334	<b>DS1088E</b>	ZJ489578CD JESD22-A114 HBM 500 VOLTS	1	PUL'S	5	0
ESD SENSITIVITY	1334	<b>DS1088E</b>	ZJ489578CD JESD22-A114 HBM 1000 VOLTS	1	PUL'S	5	0
ESD SENSITIVITY	1334	<b>DS1088E</b>	ZJ489578CD JESD22-A114 HBM 1500 VOLTS	1	PUL'S	5	0
ESD SENSITIVITY	1334	<b>DS1088E</b>	ZJ489578CD JESD22-A114 HBM 2000 VOLTS	1	PUL'S	5	0
ESD SENSITIVITY	1334	<b>DS1088E</b>	ZJ489578CD 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	1334	<b>DS1088E</b>	ZJ489578CD JESD78A, I-TEST 25C 100mA			6	0
LATCH-UP V	1334	<b>DS1088E</b>	ZJ489578CD 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	0839	DS2784	WJ942986TC 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	WJ944804AB 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	WJ946542AB 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	WJ048840AA 125C, 4.2 VOLTS	192 HRS	77	0	
HIGH TEMP OP LIFE	0948	DS1091L	WJ946344EA 150C, 3.6 VOLTS	408 HRS	45	0	
HIGH TEMP OP LIFE	0948	DS1091L	WJ946344EA 150C, 3.6 VOLTS	408 HRS	45	0	
HIGH TEMP OP LIFE	0951	DS2784	WJ049559AB 125C, 5.5 V (PSA) & 15.0 V (PSB)	1000 HRS	80	0	
HIGH TEMP OP LIFE	0951	DS1877	WJ048842AA 125C, 4.2 VOLTS	192 HRS	77	0	
HIGH TEMP OP LIFE	1004	DS3644	WS046549D 125C, 3.6V (PSA) & 3.3V (PSB)	192 HRS	45	0	
HIGH TEMP OP LIFE	1012	MAX36051	WS048836A 125C, 3.6 VOLTS	192 HRS	45	0	
HIGH TEMP OP LIFE	1013	DS2784	WJ050375AB 125C, 5.5 V (PSA) & 15.0 V (PSB)	1000 HRS	80	0	
HIGH TEMP OP LIFE	1023	DS2784	WJ051728AB 125C, 5.5 V (PSA) & 15.0 V (PSB)	1000 HRS	80	0	
HIGH TEMP OP LIFE	1026	DS3231M	QJ048856AB 125C, 5.5 VOLTS	1000 HRS	45	0	
HIGH TEMP OP LIFE	1026	DS3231M	QJ048856AB 125C, 5.5 VOLTS	1000 HRS	45	0	
HIGH TEMP OP LIFE	1026	DS3231M	QJ048856AB 125C, 5.5 VOLTS	1000 HRS	45	0	
HIGH TEMP OP LIFE	1033	DS2784	FJ050283AB 125C, 5.5V (PSA) & 5.5V (PSB)	1000 HRS	77	0	
HIGH TEMP OP LIFE	1034	MAX17040	WS049701A 125C, 5.5V (PSA) & 5.5V (PSB)	1000 HRS	48	0	

HIGH TEMP OP LIFE	1035	DS1878	WJ055999BA	125C, 5.5 VOLTS	192	HRS	77	0
HIGH TEMP OP LIFE	1041	DS3660	ZS156014AB	125C, 3.6V (PSA) & 3.3V (PSB)	213	HRS	48	0
HIGH TEMP OP LIFE	1041	DS2784	ZJ160290AB	125C, 5.5V (PSA) & 5.5V (PSB)	192	HRS	80	0
HIGH TEMP OP LIFE	1041	DS2784	ZJ160290AB	125C, 4.6 V (PSA) & 4.6 V (PSB)	1000	HRS	80	0
HIGH TEMP OP LIFE	1048	DS2784	ZJ162667AB-	125C, 4.6 V (PSA) & 4.6 V (PSB)	1000	HRS	80	0
HIGH TEMP OP LIFE	1108	DS3640	ZX148848AA	125C, 3.6V (PSA) & 3.9V (PSB)	192	HRS	45	0
HIGH TEMP OP LIFE	1122	DS3231M	ZX166109AB	125C, 5.5 VOLTS	1000	HRS	64	0
HIGH TEMP OP LIFE	1122	DS3231M	ZX166109AB	125C, 5.5 VOLTS	1000	HRS	64	0
HIGH TEMP OP LIFE	1122	DS3231M	ZX166109AB	125C, 5.5 VOLTS	1000	HRS	45	0
HIGH TEMP OP LIFE	1150	DS3232M	ZX272110AA	125C, 4.7 VOLTS (PSA)	240	HRS	80	0
HIGH TEMP OP LIFE	1150	DS3232M	ZX272110AB	125C, 4.7 VOLTS (PSA)	192	HRS	80	0
HIGH TEMP OP LIFE	1221	MAX36025	Z4223800AB	125C, 1.8V (PSB) & 3.3V (PSA)	192	HRS	80	0
HIGH TEMP OP LIFE	1221	DS3231M	FX278007AA	125C, 5.5 VOLTS	1000	HRS	80	0
HIGH TEMP OP LIFE	1239	MAX36025	Z4223800AB	125C, 1.8V (PSB) & 3.3V (PSA)	1000	HRS	80	0
HIGH TEMP OP LIFE	1239	MAX36025	Z4223800AC	125C, 1.8V (PSB) & 3.3V (PSA)	1000	HRS	80	0
HIGH TEMP OP LIFE	1240	MAX36025	Z4223800AD	125C, 1.8V (PSB) & 3.3V (PSA)	1000	HRS	80	0
HIGH TEMP OP LIFE	1334	<b>DS1088E</b>	ZJ489578CD	125C, 3.6 VOLTS	192	HRS	77	0

**Total: 0**

**FAILURE RATE:                    MTTF (YRS):            256472            FITS:            0.4**

**DEVICE HOURS: 2058622814            FAILS:            0**