

8/6/2013



**PRODUCT RELIABILITY REPORT
FOR**

MAX32590

Maxim Integrated

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

Approved by:

**Don Lipps
Manager, Reliability Engineering**

Conclusion:

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

MAX32590

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 10⁻⁵ 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):** **60187** **FITS:** **1.9**
DEVICE HOURS: **483105790** **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 90nm LOGIC, General Purpose, Single poly Seven metal, plus Al RDL, 1.0V/3.3V
 Passivation: SiO/SiN = 400nm/600nm
 Die Size: 202 x 208
 Number of Transistors: 36454442
 Interconnect: Aluminum / 0.5% Copper
 Gate Oxide Thickness: 53 Å

ESD HBM

DESCRIPTION	DATE	CODE/PRODUCT/LOT	CONDITION	READPOIN	QTY	FAILS	FA#
ESD SENSITIVITY	1235	MAX32590	ZX138411BA JESD22-A114 HBM 500 VOLTS	1	PUL'S	3	0
ESD SENSITIVITY	1235	MAX32590	ZX138411BA JESD22-A114 HBM 1000 VOLTS	1	PUL'S	3	0
ESD SENSITIVITY	1235	MAX32590	ZX138411BA JESD22-A114 HBM 1500 VOLTS	1	PUL'S	3	0
ESD SENSITIVITY	1235	MAX32590	ZX138411BA JESD22-A114 HBM 2000 VOLTS	1	PUL'S	3	0
ESD SENSITIVITY	1235	MAX32590	ZX138411BA JESD22-A114 HBM 2500 VOLTS	1	PUL'S		
Total:						0	

LATCH-UP

DESCRIPTION	DATE	CODE/PRODUCT/LOT	CONDITION	READPOIN	QTY	FAILS	FA#
LATCH-UP I	1235	MAX32590	ZX138411BA JESD78A, I-TEST 25C 100mA		6	0	
LATCH-UP I	1235	MAX32590	ZX138411BA JESD78A, I-TEST 25C 250mA		6	0	
LATCH-UP V	1235	MAX32590	ZX138411BA JESD78A, V-SUPPLY TEST 25C		6	0	
Total:						0	

OPERATING LIFE

DESCRIPTION	DATE	CODE/PRODUCT/LOT	CONDITION	READPOIN	QTY	FAILS	FA#
HIGH TEMP OP LIFE	0809	MG3500A2	P61219	125C, 1.4V (VDD1) & 3V (VDD2) & 4V (VDD3)	1000 HRS	231	0
HIGH TEMP OP LIFE	1043	MG3500A3	EX105234AD	125C, 1.4V (VDD1) & 3V (VDD2) & 4V (VDD3)	1000 HRS	45	0
HIGH TEMP OP LIFE	1043	MG3500A3	EX105234AE	125C, 1.4V (VDD1) & 3V (VDD2) & 4V (VDD3)	1000 HRS	45	0
HIGH TEMP OP LIFE	1043	MG3500A3	EX105234AG	125C, 1.4V (VDD1) & 3V (VDD2) & 4V (VDD3)	1000 HRS	77	0
HIGH TEMP OP LIFE	1043	MG3500A3	EX105234AF	125C, 1.4V (VDD1) & 3V (VDD2) & 4V (VDD3)	1000 HRS	77	0
HIGH TEMP OP LIFE	1043	MG3500A3	EX105234AD	125C, 1.4V (VDD1) & 3V (VDD2) & 4V (VDD3)	1000 HRS	32	0
HIGH TEMP OP LIFE	1235	MAX32590	ZX138411BA	105C, 1.1 V (PSB) & 3.6 V (PSA)	192 HRS	80	0

Total: 0

FAILURE RATE: **MTTF (YRS): 60187 FITS: 1.9**
DEVICE HOURS: 483105790 FAILS: 0