



11/21/2011

**PRODUCT RELIABILITY REPORT
FOR**

DS28E02, Rev A1

Maxim Integrated Products

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Conclusion:

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

DS28E02, Rev A1

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.

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:

$$\text{MTTF} = 1/\text{Fr}$$

NOTE: MTTF is frequently used interchangeably with MTBF.

The calculated failure rate for this device/process is:

FAILURE RATE: **MTTF (YRS):** **118829** **FITS:** **1.0**
DEVICE HOURS: **953802267** **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: 5.25 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 E35K, 0.4um, 3.3V CMOS with embedded Array EEPROM, embedded RSE EEPROM, 18V CMOS, P2-P1 ONO Cap, LVMOSCAP, HVMOSCAP, Varactor Cap, CP Diode, 3LM
 Passivation: TEOS Oxide-Nitride Passivation
 Die Size: 62.598425 x 64.96063
 Number of Transistors: 57520
 Interconnect: Aluminum / 0.5% Copper
 Gate Oxide Thickness: 120 Å

ESD HBM

DESCRIPTION	DATE	CODE/PRODUCT/LOT	CONDITION	READPOIN	QTY	FAILS	FA#
ESD SENSITIVITY	0923	DSQC5G1	WJ946371A JESD22-A114 HBM 500 VOLTS	1	PUL'S	3	0
ESD SENSITIVITY	0923	DSQC5G1	WJ946371A JESD22-A114 HBM 1000 VOLTS	1	PUL'S	3	0
ESD SENSITIVITY	0923	DSQC5G1	WJ946371A JESD22-A114 HBM 2000 VOLTS	1	PUL'S	3	0
ESD SENSITIVITY	0923	DSQC5G1	WJ946371A JESD22-A114 HBM 4000 VOLTS	1	PUL'S	3	0
ESD SENSITIVITY	0923	DSQC5G1	WJ946371A JESD22-A114 HBM 8000 VOLTS	1	PUL'S	3	0
Total:						0	

ESD IEC

DESCRIPTION	DATE	CODE/PRODUCT/LOT	CONDITION	READPOIN	QTY	FAILS	FA#
ESD SENSITIVITY	0923	DSQC5G1	WJ946371A IEC 61000-4-2 CONTACT 2000 VOLTS	10	PUL'S	3	0
ESD SENSITIVITY	0923	DSQC5G1	WJ946371A IEC 61000-4-2 CONTACT 4000 VOLTS	10	PUL'S	3	0
ESD SENSITIVITY	0923	DSQC5G1	WJ946371A IEC 61000-4-2 CONTACT 6000 VOLTS	10	PUL'S	3	0

ESD SENSITIVITY	0923	DSQC5G1	WJ946371A	IEC 61000-4-2 CONTACT 8000 VOLTS	10	PUL'S	3	0
ESD SENSITIVITY	0923	DSQC5G1	WJ946371A	IEC 61000-4-2 AIR 2000 VOLTS	10	PUL'S	3	0
ESD SENSITIVITY	0923	DSQC5G1	WJ946371A	IEC 61000-4-2 AIR 4000 VOLTS	10	PUL'S	3	0
ESD SENSITIVITY	0923	DSQC5G1	WJ946371A	IEC 61000-4-2 AIR 8000 VOLTS	10	PUL'S	3	0
ESD SENSITIVITY	0923	DSQC5G1	WJ946371A	IEC 61000-4-2 AIR 15000 VOLTS	10	PUL'S	3	0
Total:							0	

LATCH-UP

DESCRIPTION	DATE	CODE/PRODUCT/LOT	CONDITION	READPOIN	QTY	FAILS	FA#
LATCH-UP V	0923	DSQC5G1	WJ946371A	JESD78A, V-SUPPLY TEST 125C		6	0
Total:							0

OPERATING LIFE

DESCRIPTION	DATE	CODE/PRODUCT/LOT	CONDITION	READPOIN	QTY	FAILS	FA#
HIGH TEMP REVERSE BIAS	0447	DSQ3301-K01	QH449599A	125C, 5.5 VOLTS	1000 HRS	45	0
HIGH TEMP REVERSE BIAS	0504	DSQ3301-K01	QH518151A	125C, 5.5 VOLTS	1000 HRS	45	0
HIGH TEMP REVERSE BIAS	0504	DSQ3301-K01	QH518151AF	125C, 5.5 VOLTS	1000 HRS	45	0
HIGH TEMP REVERSE BIAS	0525	DSQ3301-K01	QJ533120AB	125C, 5.5 VOLTS	1000 HRS	77	0
HIGH TEMP REVERSE BIAS	0526	DSQ3301-K01	QJ533120AC	125C, 5.5 VOLTS	1000 HRS	77	0
HIGH TEMP REVERSE BIAS	0611	DSQ3301-K01	IH533120AA	125C, 5.5 VOLTS	1000 HRS	77	0
HIGH TEMP OP LIFE	0921	DSQC5G1	WJ946371A	125C, 5.25 VOLTS	1000 HRS	77	0
HIGH TEMP OP LIFE	0921	DSQC5G1	WJ946370A	125C, 5.25 VOLTS	1000 HRS	77	0
HIGH TEMP OP LIFE	0925	DSQC5G1	WJ945484A	125C, 5.25 VOLTS	1000 HRS	77	0
HIGH TEMP OP LIFE	0936	DSRB1	WJ046370D	125C, 3.65 VOLTS	192 HRS	77	0
HIGH TEMP OP LIFE	1037	DSQ3301-K04+	WW156001E	125C, 5.25 VOLTS	192 HRS	45	0
HIGH TEMP OP LIFE	1046	DS2431	ZJ163079AC	125C, 5.25 VOLTS	192 HRS	77	0
HIGH TEMP OP LIFE	1047	DS24B33	ZU156000CB	125C, 5.25 VOLTS	192 HRS	77	0
HIGH TEMP OP LIFE	1113	DS2431	FJ165741AA	125C, 5.25 VOLTS	1000 HRS	77	0
HIGH TEMP REVERSE BIAS	1122	DSQ3301-K04+	ZJ166825AC	125C, 5.5 VOLTS	1000 HRS	77	0
HIGH TEMP REVERSE BIAS	1123	DSQ3301-K04+	ZJ166825AC	125C, 5.5 VOLTS	1000 HRS	77	0
HIGH TEMP REVERSE BIAS	1124	DSQ3301-K04+	ZJ166825AC	125C, 5.5 VOLTS	1000 HRS	77	0

HIGH TEMP OP LIFE	1124	DS28E01	FH166745AB 125C, 5.25 VOLTS	500	HRS	77	0
HIGH TEMP OP LIFE	1135	DS28EC20	ZJ272094AB- 125C, 5.25 VOLTS	192	HRS	77	0
				Total:			0
FAILURE RATE:		MTTF (YRS):	118829	FITS:		1.0	
		DEVICE HOURS:	953802267	FAILS:		0	