

**PRODUCT RELIABILITY REPORT  
FOR**

**DS28EA00, Rev A1**

**Dallas Semiconductor**

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**Conclusion:**

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

DS28EA00, Rev A1

In addition, Dallas Semiconductor'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:

$$MTTF = 1/Fr$$

NOTE: MTTF is frequently used interchangeably with MTBF.

The calculated failure rate for this device/process is:

<b>FAILURE RATE:</b>	<b>MTTF (YRS):</b>	<b>75731</b>	<b>FITS:</b>	<b>1.5</b>
	<b>DEVICE HOURS:</b>	<b>644500</b>	<b>FAILS:</b>	<b>0</b>

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. "\*" after DATE CODE denotes specific product data.

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**Device Information:**

Process: E6WA-2P2M,HPVt,E2,EPROGVt,TCN1,PF ALOCOS:GOI  
 Passivation: NRL Laser w/Nov TEOS Oxide-Nitride  
 Die Size: 62 x 80  
 Number of Transistors: 0  
 Interconnect: Aluminum / 1% Silicon / 0.5% Copper  
 Gate Oxide Thickness: 150 Å

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**ELECTRICAL CHARACTERIZATION**

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QTY	FAILS	FA#
ESD SENSITIVITY	0635 *	EOS/ESD S5.1 HBM 500 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0635 *	EOS/ESD S5.1 HBM 1000 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0635 *	EOS/ESD S5.1 HBM 2000 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0635 *	EOS/ESD S5.1 HBM 4000 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0635 *	EOS/ESD S5.1 HBM 8000 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0635 *	IEC 61000-4-2 CONTACT 2000 VOLTS	10 PUL'S	3	0	
ESD SENSITIVITY	0635 *	IEC 61000-4-2 CONTACT 4000 VOLTS	10 PUL'S	3	0	
ESD SENSITIVITY	0635 *	IEC 61000-4-2 CONTACT 8000 VOLTS	10 PUL'S	3	0	
ESD SENSITIVITY	0635 *	IEC 61000-4-2 AIR 2000 VOLTS	10 PUL'S	3	0	
ESD SENSITIVITY	0635 *	IEC 61000-4-2 AIR 4000 VOLTS	10 PUL'S	3	0	
ESD SENSITIVITY	0635 *	IEC 61000-4-2 AIR 8000 VOLTS	10 PUL'S	3	0	
ESD SENSITIVITY	0635 *	IEC 61000-4-2 AIR 15000 VOLTS	10 PUL'S	3	0	
LATCH-UP	0635 *	JESD78, I-TEST 125C		6	0	
LATCH-UP	0635 *	JESD78, V-SUPPLY TEST 125C		6	0	
<b>Total:</b>					<b>0</b>	

**OPERATING LIFE**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
HIGH TEMP REVERSE BIAS	0416		125C, 5.5 VOLTS	1000 HRS	48	0	
HIGH TEMP REVERSE BIAS	0417		125C, 5.5 VOLTS	1000 HRS	48	0	
HIGH TEMP REVERSE BIAS	0417		125C, 5.5 VOLTS	1000 HRS	48	0	
HIGH TEMP OP LIFE	0417		125C, 5.5 VOLTS	1000 HRS	77	0	
HIGH TEMP OP LIFE	0443		125C, 5.5 VOLTS	1000 HRS	77	0	
HIGH VOLTAGE LIFE	0452		125C, 5.5 VOLTS	1000 HRS	77	0	
HIGH TEMP REVERSE BIAS	0513		125C, 5.5 VOLTS	1000 HRS	77	0	
HIGH TEMP OP LIFE	0539		125C, 5.5 VOLTS	1000 HRS	77	0	
HIGH TEMP OP LIFE	0626		125C, 5.5 VOLTS	1000 HRS	77	0	
HIGH TEMP OP LIFE	0635	*	125C, 5.5 VOLTS	500 HRS	77	0	
<b>Total:</b>						<b>0</b>	

**W/E ENDURANCE AND DATA RET'N**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
WRITE CYCLE STRESS (KCYS)	0443		70 C, 5.5 VOLTS	30 KCYS	77	0	
STORAGE LIFE			150C	1000 HRS	77	0	
WRITE CYCLE STRESS (KCYS)	0452		85 C, 5.5 VOLTS	50 KCYS	77	0	
STORAGE LIFE			150C	1000 HRS	77	0	
WRITE CYCLE STRESS (KCYS)	0539		55 C, 5.5 VOLTS	30 KCYS	77	0	
STORAGE LIFE			150C	500 HRS	77	0	
WRITE CYCLE STRESS (KCYS)	0626		85 C, 5.5 VOLTS	30 KCYS	77	0	
STORAGE LIFE			150C	1000 HRS	75	0	
WRITE CYCLE STRESS (KCYS)	0635	*	85 C, 5.5 VOLTS	30 KCYS	77	0	
STORAGE LIFE		*	150C	96 HRS	77	0	
WRITE CYCLE STRESS (KCYS)	0635	*	25 C, 5.5 VOLTS	50 KCYS	77	0	
STORAGE LIFE		*	150C	96 HRS	77	0	
<b>Total:</b>						<b>0</b>	

**FAILURE RATE:                    MTTF (YRS):            75731            FITS:            1.5**  
**DEVICE HOURS:        644500        FAILS:            0**