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PRODUCT RELIABILITY REPORT
FOR

DS1856, Rev A5

Dallas Semiconductor

4401 South Beltwood Parkway
Dallas, TX 75244-3292

Prepared by:

Ken Wendel
Reliability Engineering Manager
Dallas Semiconductor
4401 South Beltwood Pkwy.
Dallas, TX 75244-3292
Email : ken.wendel@dalsemi.com
ph: 972-371-3726
fax: 972-371-6016
mbl: 214-435-6610

Conclusion:

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

DS1856, Rev A5

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.

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):**	**187066**	**FITS:**	**0.6**
	DEVICE HOURS:	**1592000**	**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. "*" after DATE CODE denotes specific product data and SEQ No. to identify specific line items in the report for comments when required.

Device Information:

Process:	E6WA-2P2M,HPVt,E2,EPROGVt,TCZ,PF ALOCOS:GOI
Passivation:	Passivation w/Nov TEOS Oxide-Nitride
Die Size:	98 x 131
Number of Transistors:	51061
Interconnect:	Aluminum / 0.5% Copper
Gate Oxide Thickness:	150 Å

ELECTRICAL CHARACTERIZATION

DESCRIPTION	DATE CODE/SEQ		CONDITION	READPOINT		QTY	FAILS	FA#
ESD SENSITIVITY	0519	* 1	EOS/ESD S5.1 HBM 500 VOLTS	1	PUL'S	3	0	
ESD SENSITIVITY	0519	* 2	EOS/ESD S5.1 HBM 1000 VOLTS	1	PUL'S	3	0	
ESD SENSITIVITY	0519	* 3	EOS/ESD S5.1 HBM 2000 VOLTS	1	PUL'S	3	0	
ESD SENSITIVITY	0519	* 4	EOS/ESD S5.1 HBM 4000 VOLTS	1	PUL'S	3	0	
ESD SENSITIVITY	0519	* 5	EOS/ESD S5.1 HBM 8000 VOLTS	1	PUL'S	3	3	No FA
LATCH-UP	0519	* 6	JESD78, I-TEST 125C			6	0	
LATCH-UP	0519	* 7	JESD78, V-SUPPLY TEST 125C			6	0	
				Total:			**3**	

OPERATING LIFE

DESCRIPTION	DATE CODE/SEQ		CONDITION	READPOINT		QTY	FAILS	FA#
HIGH TEMP OP LIFE	0519	* 1	125C, 5.5 VOLTS	1000	HRS	77	0	
HIGH TEMP OP LIFE	0535		125C, 3.6 VOLTS	408	HRS	45	0	
HIGH TEMP OP LIFE	0539		125C, 5.5 VOLTS	1000	HRS	77	0	
HIGH TEMP OP LIFE	0548		125C, 5.5V (PSA) & 3.6V (PSB)	1000	HRS	77	0	
HIGH TEMP OP LIFE	0549		125C, 5.5 VOLTS	1000	HRS	77	0	

HIGH TEMP OP LIFE	0552	125C, +5.5V (PSA), +5.5V (PSD)	1000	HRS	77	0
HIGH TEMP REVERSE BIAS	0611	125C, 5.5 VOLTS	1000	HRS	77	0
HIGH TEMP OP LIFE	0612	125C, 5.5 VOLTS	1000	HRS	77	0
HIGH TEMP OP LIFE	0623	125C, 5.5V (PSA), -7.0V (PSC) & +7.0V (PSD)	1000	HRS	77	0
HIGH TEMP OP LIFE	0626	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, 5.25 VOLTS	1000	HRS	77	0
		125C, 5.25 VOLTS	1000	HRS	77	0
HIGH TEMP OP LIFE	0635	125C, 5.5 VOLTS	1000	HRS	77	0
HIGH TEMP OP LIFE	0645	125C, 5.5 VOLTS	1000	HRS	77	0
HIGH TEMP OP LIFE	0712	125C, 5.5 VOLTS	1000	HRS	45	0
HIGH TEMP OP LIFE	0714	125C, 5.5 VOLTS	1000	HRS	77	0
HIGH TEMP REVERSE BIAS	0717	125C, 5.25 VOLTS	1000	HRS	48	0
		125C, 5.25 VOLTS	1000	HRS	48	0
HIGH TEMP REVERSE BIAS	0717	125C, 5.25 VOLTS	1000	HRS	48	0
		125C, 5.25 VOLTS	1000	HRS	48	0
HIGH TEMP REVERSE BIAS	0717	125C, 5.25 VOLTS	1000	HRS	48	0
		125C, 5.25 VOLTS	1000	HRS	48	0
HIGH TEMP OP LIFE	0718	125C, 5.25 VOLTS	192	HRS	45	0
HIGH TEMP OP LIFE	0720	125C, 5.5 VOLTS	1000	HRS	77	0
				Total:		**0**

W/E ENDURANCE AND DATA RET'N

DESCRIPTION	DATE CODE/SEQ		CONDITION	READPOINT		QTY	FAILS	FA#
WRITE CYCLE STRESS (KCYS)	0519	* 2	70 C, 5.5 VOLTS	30	KCYS	77	1	30037704
STORAGE LIFE		* 2	150C	1000	HRS	76	0	
WRITE CYCLE STRESS (KCYS)	0519	* 1	70 C, 5.5 VOLTS	30	KCYS	110	0	
STORAGE LIFE		* 1	150C	96	HRS	110	0	
WRITE CYCLE STRESS (KCYS)	0519	* 2	70 C, 5.5 VOLTS	30	KCYS	110	0	
STORAGE LIFE		* 2	150C	96	HRS	110	0	
WRITE CYCLE STRESS (KCYS)	0519	* 3	70 C, 5.5 VOLTS	30	KCYS	110	0	
STORAGE LIFE		* 3	150C	96	HRS	110	0	
WRITE CYCLE STRESS (KCYS)	0519	* 4	70 C, 5.5 VOLTS	30	KCYS	110	0	
STORAGE LIFE		* 4	150C	96	HRS	110	0	
WRITE CYCLE STRESS (KCYS)	0519	* 5	70 C, 5.5 VOLTS	30	KCYS	110	0	

STORAGE LIFE	0519	* 5	150C	96	HRS	110	0
WRITE CYCLE STRESS (KCYS)	0519	* 6	70 C, 5.5 VOLTS	30	KCYS	110	0
STORAGE LIFE		* 6	150C	96	HRS	110	0
WRITE CYCLE STRESS (KCYS)	0519	* 7	70 C, 5.5 VOLTS	30	KCYS	110	0
STORAGE LIFE		* 7	150C	96	HRS	110	0
WRITE CYCLE STRESS (KCYS)	0519	* 8	70 C, 5.5 VOLTS	30	KCYS	110	0
STORAGE LIFE		* 8	150C	96	HRS	110	0
WRITE CYCLE STRESS (KCYS)	0519	* 9	70 C, 5.5 VOLTS	30	KCYS	110	0
STORAGE LIFE		* 9	150C	96	HRS	110	0
WRITE CYCLE STRESS (KCYS)	0519	* 10	70 C, 5.5 VOLTS	30	KCYS	110	0
STORAGE LIFE		* 10	150C	96	HRS	110	0
WRITE CYCLE STRESS (KCYS)	0519	* 11	70 C, 5.5 VOLTS	30	KCYS	110	0
STORAGE LIFE		* 11	150C	96	HRS	110	0
WRITE CYCLE STRESS (KCYS)	0519	* 12	70 C, 5.5 VOLTS	30	KCYS	110	0
STORAGE LIFE		* 12	150C	96	HRS	110	0
WRITE CYCLE STRESS (KCYS)	0519	* 13	70 C, 5.5 VOLTS	30	KCYS	110	0
STORAGE LIFE		* 13	150C	96	HRS	110	0
WRITE CYCLE STRESS (KCYS)	0519	* 14	70 C, 5.5 VOLTS	30	KCYS	110	0
STORAGE LIFE		* 14	150C	96	HRS	110	0
WRITE CYCLE STRESS (KCYS)	0519	* 15	70 C, 5.5 VOLTS	30	KCYS	110	0
STORAGE LIFE		* 15	150C	96	HRS	110	0
WRITE CYCLE STRESS (KCYS)	0519	* 16	70 C, 5.5 VOLTS	30	KCYS	110	0
STORAGE LIFE		* 16	150C	96	HRS	109	0
WRITE CYCLE STRESS (KCYS)	0519	* 17	70 C, 5.5 VOLTS	30	KCYS	110	0
STORAGE LIFE		* 17	150C	96	HRS	109	0
WRITE CYCLE STRESS (KCYS)	0519	* 18	70 C, 5.5 VOLTS	30	KCYS	110	0
STORAGE LIFE		* 18	150C	96	HRS	110	0
WRITE CYCLE STRESS (KCYS)	0519	* 19	70 C, 5.5 VOLTS	30	KCYS	110	0
STORAGE LIFE		* 19	150C	96	HRS	110	0
WRITE CYCLE STRESS (KCYS)	0532	* 2	70 C, 5.5 VOLTS	30	KCYS	110	0
STORAGE LIFE		* 2	150C	96	HRS	109	0
WRITE CYCLE STRESS (KCYS)	0532	* 4	70 C, 5.5 VOLTS	30	KCYS	110	1 30043782
STORAGE LIFE		* 4	150C	96	HRS	109	0

WRITE CYCLE STRESS (KCYS)	0532	* 5	70 C, 5.5 VOLTS	30	KCYS	110	0
STORAGE LIFE		* 5	150C	96	HRS	110	0
WRITE CYCLE STRESS (KCYS)	0532	* 6	70 C, 5.5 VOLTS	30	KCYS	110	0
STORAGE LIFE		* 6	150C	96	HRS	110	0
WRITE CYCLE STRESS (KCYS)	0532	* 7	70 C, 5.5 VOLTS	30	KCYS	110	0
STORAGE LIFE		* 7	150C	96	HRS	110	0
WRITE CYCLE STRESS (KCYS)	0535		70 C, 3.6 VOLTS	10	KCYS	77	0
STORAGE LIFE			150C	500	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)	0548		70 C, 5.5V (PSA) & 3.6V (PSB)	50	KCYS	77	0
STORAGE LIFE			150C	1000	HRS	77	0
WRITE CYCLE STRESS (KCYS)	0549		85 C, 5.5 VOLTS	30	KCYS	77	0
STORAGE LIFE			150C	1000	HRS	77	0
WRITE CYCLE STRESS (KCYS)	0552		70C, 5.5 V (PSA) & 5.5 V (PSD)	30	KCYS	77	0
STORAGE LIFE			150C	1000	HRS	77	0
WRITE CYCLE STRESS (KCYS)	0612		70 C, 5.5 VOLTS	30	KCYS	77	0
STORAGE LIFE			150C	1000	HRS	77	0
WRITE CYCLE STRESS (KCYS)	0623		70C, 5.5 V (PSA), -7.0 V (PSC) & +7.0V (PSD)	30	KCYS	77	0
STORAGE LIFE			150C	1000	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		25 C, 5.0 VOLTS	50	KCYS	77	0
			25 C, 5.0 VOLTS	50	KCYS	77	0
STORAGE LIFE			150C	1000	HRS	77	0
			150C	1000	HRS	77	0
WRITE CYCLE STRESS (KCYS)	0635		85 C, 5.5 VOLTS	30	KCYS	77	0
STORAGE LIFE			150C	1000	HRS	77	0
WRITE CYCLE STRESS (KCYS)	0635		25 C, 5.5 VOLTS	50	KCYS	77	0
STORAGE LIFE			150C	1000	HRS	77	0
WRITE CYCLE STRESS (KCYS)	0709		25 C, 5.5 VOLTS	200	KCYS	77	0
STORAGE LIFE			150C	1000	HRS	77	0
WRITE CYCLE STRESS (KCYS)	0712		70 C, 5.5 VOLTS	30	KCYS	77	0
STORAGE LIFE			150C	1000	HRS	77	0

WRITE CYCLE STRESS (KCYS)	0714	85 C, 5.5 VOLTS	30	KCYS	77	0
STORAGE LIFE		150C	1000	HRS	77	0
WRITE CYCLE STRESS (KCYS)	0720	70 C, 5.5 VOLTS	30	KCYS	77	
				Total:		**2**

FAILURE RATE:	**MTTF (YRS):**	**187066**	**FITS:**	**0.6**
	DEVICE HOURS:	**1592000**	**FAILS:**	**0**

30037704 - Failure due to a gate oxide defect at the poly gate of an NMOS transistor in the EEPROM high voltage control circuitry. 30043782 - Analysis of the second EEPROM endurance failure was due to a thick gate oxide defect on a PMOS transistor in the EEPROM control circuitry.