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**PRODUCT RELIABILITY REPORT
FOR**

DS28EC20, Rev A2

Maxim Integrated Products

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Conclusion:

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

DS28EC20, Rev A2

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:

$$MTTF = 1/Fr$$

NOTE: MTTF is frequently used interchangeably with MTBF.

The calculated failure rate for this device/process is:

FAILURE RATE:	MTTF (YRS):	181133	FITS:	0.6
	DEVICE HOURS:	1455544	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: E35WN-3P3M,DPE2,NTC,DSD,PDES,DRES,Cap,ENPN,DPT,HTO,SgHalo
 Passivation: TEOS Ox-Nit 2-Mask Laser/Pass for E35WM; Full BEOL at X3; PT only in Dallas
 Die Size: 85 x 88
 Number of Transistors: 0
 Interconnect: Aluminum / 0.5% Copper
 Gate Oxide Thickness: 120 Å

ELECTRICAL CHARACTERIZATION

DESCRIPTION	DATE CODE/SEQ	CONDITION	READPOINT	QTY	FAILS	FA#
ESD SENSITIVITY	0717 * 1	EOS/ESD S5.1 HBM 500 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0717 * 2	EOS/ESD S5.1 HBM 1000 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0717 * 3	EOS/ESD S5.1 HBM 2000 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0717 * 4	EOS/ESD S5.1 HBM 4000 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0717 * 5	EOS/ESD S5.1 HBM 8000 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0717 * 6	IEC 61000-4-2 CONTACT 2000 VOLTS	10 PUL'S	3	0	
ESD SENSITIVITY	0717 * 7	IEC 61000-4-2 CONTACT 4000 VOLTS	10 PUL'S	3	0	
ESD SENSITIVITY	0717 * 8	IEC 61000-4-2 CONTACT 6000 VOLTS	10 PUL'S	3	0	
ESD SENSITIVITY	0717 * 9	IEC 61000-4-2 CONTACT 8000 VOLTS	10 PUL'S	3	0	
ESD SENSITIVITY	0717 * 10	IEC 61000-4-2 AIR 2000 VOLTS	10 PUL'S	3	0	
ESD SENSITIVITY	0717 * 11	IEC 61000-4-2 AIR 4000 VOLTS	10 PUL'S	3	0	
ESD SENSITIVITY	0717 * 12	IEC 61000-4-2 AIR 8000 VOLTS	10 PUL'S	3	0	
ESD SENSITIVITY	0717 * 13	IEC 61000-4-2 AIR 15000 VOLTS	10 PUL'S	3	0	

LATCH-UP	0717	* 14	JESD78, V-SUPPLY TEST 25C	6	0
LATCH-UP	0717	* 15	JESD78, V-SUPPLY TEST 125C	6	0
Total:				0	0

OPERATING LIFE

DESCRIPTION	DATE CODE/SEQ	CONDITION	READPOINT	QTY	FAILS	FA#
HIGH TEMP OP LIFE	0602	125C, 5.5 V (PSA) & 0.0 V (PSB)	1000 HRS	77	0	
HIGH TEMP OP LIFE	0604	125C, 5.5 VOLTS	1000 HRS	77	0	
HIGH TEMP OP LIFE	0620	125C, 5.25 VOLTS	1000 HRS	77	0	
HIGH TEMP OP LIFE	0622	125C, 5.25 VOLTS	1000 HRS	77	0	
HIGH TEMP OP LIFE	0624	125C, 5.5 VOLTS	192 HRS	72	0	
HIGH TEMP OP LIFE	0624	125C, 5.25 VOLTS	1000 HRS	45	0	
HIGH TEMP OP LIFE	0629	125C, 3.5 VOLTS	1000 HRS	77	0	
HIGH TEMP OP LIFE	0629	125C, 5.25 VOLTS	1000 HRS	77	0	
HIGH TEMP OP LIFE	0632	125C, 5.25 VOLTS	1000 HRS	77	0	
HIGH TEMP OP LIFE	0637	125C, 5.25 VOLTS	1000 HRS	77	0	
HIGH TEMP REVERSE BIAS	0639	125C, 5.25 VOLTS	1000 HRS	80	0	
HIGH TEMP REVERSE BIAS	0639	125C, 5.25 VOLTS	1000 HRS	80	0	
HIGH TEMP OP LIFE	0642	125C, 5.5 VOLTS	1000 HRS	77	0	
HIGH TEMP OP LIFE	0702	125C, 5.25 VOLTS	1000 HRS	77	0	
HIGH TEMP OP LIFE	0705	125C, 3.6 VOLTS	1000 HRS	77	0	
HIGH TEMP OP LIFE	0708	125C, 5.25 VOLTS	1000 HRS	77	0	
HIGH TEMP OP LIFE	0711	125C, 5.5 VOLTS	1000 HRS	45	0	
HIGH TEMP OP LIFE	0713	125C, 5.5 VOLTS	1000 HRS	77	0	
HIGH TEMP OP LIFE	0714	125C, 5.25 VOLTS	1000 HRS	77	0	
HIGH TEMP OP LIFE	0717	* 1	125C, 5.25 VOLTS	1000 HRS	77	0
HIGH TEMP OP LIFE	0723	150C, 5.25 VOLTS	816 HRS	45	0	
Total:				0	0	

W/E ENDURANCE AND DATA RET'N

DESCRIPTION	DATE CODE/SEQ	CONDITION	READPOINT	QTY	FAILS	FA#
WRITE CYCLE STRESS (KCYS)	0602	85 C, 5.5 V (PSA) & 15.0 V (PSB)	1 KCYS	77	0	
STORAGE LIFE	0602	150C	1000 HRS	77	0	
WRITE CYCLE STRESS (KCYS)	0604	70 C, 5.5 VOLTS	30 KCYS	77	0	
STORAGE LIFE	0604	150C	1000 HRS	77	0	
WRITE CYCLE STRESS (KCYS)	0604	85 C, 5.5 VOLTS	50 KCYS	77	0	
STORAGE LIFE	0604	150C	1000 HRS	77	0	

WRITE CYCLE STRESS (KCYS)	0620	85 C, 5.25 VOLTS	50	KCYS	77	0
STORAGE LIFE	0620	150C	1000	HRS	77	0
WRITE CYCLE STRESS (KCYS)	0622	85 C, 5.25 VOLTS	30	KCYS	77	0
STORAGE LIFE	0622	150C	1000	HRS	77	0
WRITE CYCLE STRESS (KCYS)	0624	70 C, 5.5 VOLTS	50	KCYS	72	0
STORAGE LIFE	0624	150C	1000	HRS	72	0
WRITE CYCLE STRESS (KCYS)	0629	85 C, 3.5 VOLTS	10	KCYS	77	0
STORAGE LIFE	0629	150C	1000	HRS	77	0
WRITE CYCLE STRESS (KCYS)	0629	25 C, 3.5 VOLTS	40	KCYS	77	0
STORAGE LIFE	0629	150C	1000	HRS	77	0
WRITE CYCLE STRESS (KCYS)	0629	85 C, 5.25 VOLTS	50	KCYS	77	0
STORAGE LIFE	0629	150C	1000	HRS	77	0
WRITE CYCLE STRESS (KCYS)	0632	85 C, 5.25 VOLTS	50	KCYS	77	0
STORAGE LIFE	0632	150C	1000	HRS	77	0
WRITE CYCLE STRESS (KCYS)	0633	85 C, 5.25 VOLTS	50	KCYS	231	0
STORAGE LIFE	0633	150C	1000	HRS	231	0
WRITE CYCLE STRESS (KCYS)	0637	85 C, 5.25 VOLTS	50	KCYS	77	0
STORAGE LIFE	0637	150C	1000	HRS	76	0
WRITE CYCLE STRESS (KCYS)	0637	25 C, 5.25 VOLTS	200	KCYS	77	0
STORAGE LIFE	0637	150C	1000	HRS	77	0
WRITE CYCLE STRESS (KCYS)	0642	70 C, 5.5 VOLTS	30	KCYS	77	0
STORAGE LIFE	0642	150C	1000	HRS	77	0
WRITE CYCLE STRESS (KCYS)	0705	25 C, 3.6 VOLTS	200	KCYS	77	0
STORAGE LIFE	0705	150C	1000	HRS	77	0
WRITE CYCLE STRESS (KCYS)	0708	85 C, 5.25 VOLTS	50	KCYS	77	0
STORAGE LIFE	0708	150C	1000	HRS	77	0
WRITE CYCLE STRESS (KCYS)	0708	25 C, 5.25 VOLTS	200	KCYS	77	0
STORAGE LIFE	0708	150C	1000	HRS	77	0
WRITE CYCLE STRESS (KCYS)	0711	85 C, 5.25 VOLTS	30	KCYS	77	0
STORAGE LIFE	0711	150C	500	HRS	77	0
WRITE CYCLE STRESS (KCYS)	0711	85 C, 5.5 VOLTS	50	KCYS	77	0
STORAGE LIFE	0711	150C	1000	HRS	77	0
WRITE CYCLE STRESS (KCYS)	0713	70 C, 5.5 VOLTS	30	KCYS	77	0

STORAGE LIFE	0713		150C	1000 HRS	77	0	
WRITE CYCLE STRESS (KCYS)	0714		85 C, 5.25 VOLTS	50 KCYS	77	0	
STORAGE LIFE	0714		150C	1000 HRS	76	0	
WRITE CYCLE STRESS (KCYS)	0714		25 C, 5.25 VOLTS	200 KCYS	77	0	
STORAGE LIFE	0714		150C	1000 HRS	77	0	
WRITE CYCLE STRESS (KCYS)	0717	* 2	85 C, 5.25 VOLTS	50 KCYS	77	0	
STORAGE LIFE	0717	* 2	150C	500 HRS	77	0	
WRITE CYCLE STRESS (KCYS)	0717	* 3	25 C, 5.25 VOLTS	200 KCYS	77	1	40003565
STORAGE LIFE	0717	* 3	150C	96 HRS	76	0	
WRITE CYCLE STRESS (KCYS)	0722		85 C, 5.25 VOLTS	50 KCYS	77	0	
STORAGE LIFE	0722		150C	2000 HRS	77	0	
WRITE CYCLE STRESS (KCYS)	0722		125C, 5.25 VOLTS	1 KCYS	77	0	
STORAGE LIFE	0722		150C	2000 HRS	76	0	
						Total:	1

FAILURE RATE: **MTTF (YRS):** **181133** **FITS:** **0.6**
 DEVICE HOURS: **1455544** **FAILS:** **0**

40003565: Random Poly masking defect.