



7/18/2008

**PRODUCT RELIABILITY REPORT  
FOR**

**DS2786, Rev A2**

**Maxim Integrated Products**

**4401 South Beltwood Parkway  
Dallas, TX 75244-3292**

**Prepared by:**

**Ken Wendel  
Director, Reliability Engineering  
Maxim Integrated Products  
4401 South Beltwood Pkwy.  
Dallas, TX 75244-3292  
Email : ken.wendel@maxim-ic.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 Maxim products:

DS2786, 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](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:

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

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>102346</b>	<b>FITS:</b>	<b>1.1</b>
	<b>DEVICE HOURS:</b>	<b>871000</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. **Bold** Product Number denotes specific product data.

**Device Information:**

Process: E35XG-3P3M,GOI,DPE2,CrSi,DSD,PDES,PDRES,Cap,ENPN,DPT,HTO,S  
 Passivation: TEOS Ox-Nit Passivation for E35X; Full BEOL at SA; PT only in Dallas  
 Die Size: 70 x 88  
 Number of Transistors: 0  
 Interconnect: Aluminum / 0.5% Copper  
 Gate Oxide Thickness: 120 Å

**DATA RETENTION**

DESCRIPTION	DATE	CODE/PRODUCT/LOT	CONDITION	READPOINT	QTY	FAILS	FA#
STORAGE LIFE	0618	DS2746 QJ626604B	150C	1000 HRS	77	0	
STORAGE LIFE	0629	DS2745 QD635241	150C	1000 HRS	77	0	
				<b>Total:</b>		<b>0</b>	

**ELECTRICAL CHARACTERIZATION**

DESCRIPTION	DATE	CODE/PRODUCT/LOT	CONDITION	READPOINT	QTY	FAILS	FA#
ESD SENSITIVITY	0642	<b>DS2786</b> QJ652645A	EOS/ESD S5.1 HBM 500 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0642	<b>DS2786</b> QJ652645A	EOS/ESD S5.1 HBM 1000 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0642	<b>DS2786</b> QJ652645A	EOS/ESD S5.1 HBM 2000 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0642	<b>DS2786</b> QJ652645A	EOS/ESD S5.1 HBM 3000 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0642	<b>DS2786</b> QJ652645A	EOS/ESD S5.1 HBM 4000 VOLTS	1 PUL'S	3	0	
LATCH-UP	0642	<b>DS2786</b> QJ652645A	JESD78, I-TEST 125C		6	0	
LATCH-UP	0642	<b>DS2786</b> QJ652645A	JESD78, V-SUPPLY TEST 125C		6	0	
ESD SENSITIVITY	0723	<b>DS2786</b> QJ801005B	EOS/ESD S5.1 HBM 500 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0723	<b>DS2786</b> QJ801005B	EOS/ESD S5.1 HBM 1000 VOLTS	1 PUL'S	3	0	

ESD SENSITIVITY	0723	<b>DS2786</b>	QJ801005B	EOS/ESD S5.1 HBM 2000 VOLTS	1	PUL'S	3	0	
ESD SENSITIVITY	0723	<b>DS2786</b>	QJ801005B	EOS/ESD S5.1 HBM 3000 VOLTS	1	PUL'S	3	0	
ESD SENSITIVITY	0723	<b>DS2786</b>	QJ801005B	EOS/ESD S5.1 HBM 4000 VOLTS	1	PUL'S	3	3	No FA
LATCH-UP	0723	<b>DS2786</b>	QJ801005B	JESD78, I-TEST 125C			6	0	
LATCH-UP	0723	<b>DS2786</b>	QJ801005B	JESD78, V-SUPPLY TEST 125C			6	0	
<b>Total:</b>								<b>3</b>	

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### OPERATING LIFE

DESCRIPTION	DATE	CODE/PRODUCT/LOT	CONDITION	READPOINT	QTY	FAILS	FA#	
HIGH TEMP OP LIFE	0536	DS2781	QK544612	125C, 5.5 VOLTS	1000 HRS	77	0	
HIGH TEMP OP LIFE	0618	DS2746	QJ626604B	125C, 5.5 VOLTS	1000 HRS	45	0	
HIGH TEMP OP LIFE	0629	DS2745	QD635241	125C, 5.5 VOLTS	1000 HRS	77	0	
HIGH TEMP OP LIFE	0640	DS2756	QK621609	125C, 5.5 VOLTS	1000 HRS	45	0	
HIGH TEMP OP LIFE	0642	<b>DS2786</b>	QJ652645A	125C, 5.5 VOLTS	1000 HRS	45	0	
HIGH TEMP OP LIFE	0714	DS2784	QJ714637A	125C, 5.5 V (PSA) & 15.0 V (PSB)	1000 HRS	77	0	
HIGH TEMP OP LIFE	0723	<b>DS2786</b>	QJ801005B	125C, 5.5 VOLTS	1000 HRS	45	0	
HIGH TEMP OP LIFE	0727	DS2781	QK738184	125C, 5.5 VOLTS	1000 HRS	77	0	
HIGH TEMP OP LIFE	0732	DS2784	QJ738201B	125C, 5.5 V (PSA) & 15.0 V (PSB)	1000 HRS	77	0	
HIGH TEMP OP LIFE	0736	DS2788	QK718177	125C, 5.5 VOLTS	1000 HRS	77	0	
HIGH TEMP OP LIFE	0744	DS2745	QD801003	125C, 5.5 VOLTS	1000 HRS	77	0	
HIGH TEMP OP LIFE	0749	DS2782	QK753345	125C, 5.5 VOLTS	1000 HRS	75	0	
HIGH TEMP OP LIFE	0804	DS2780	QK752167	125C, 5.5 VOLTS	1000 HRS	77	0	
<b>Total:</b>							<b>0</b>	

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

DESCRIPTION	DATE	CODE/PRODUCT/LOT	CONDITION	READPOINT	QTY	FAILS	FA#
WRITE CYCLE STRESS (KCYS)	0536	DS2781	QK544612	50 C, 5.5 VOLTS	50 KCYS	77	0
STORAGE LIFE	0536	DS2781	QK544612	150C	1000 HRS	77	0
WRITE CYCLE STRESS (KCYS)	0541	DS2780	QK547674	50 C, 5.5 VOLTS	50 KCYS	77	0
STORAGE LIFE	0541	DS2780	QK547674	150C	1000 HRS	76	0
WRITE CYCLE STRESS (KCYS)	0541	DS2780	QK547674	25 C, 5.5 VOLTS	80 KCYS	77	0
STORAGE LIFE	0541	DS2780	QK547674	150C	1000 HRS	77	0
WRITE CYCLE STRESS (KCYS)	0541	DS2780	QK547674	85 C, 5.5 VOLTS	20 KCYS	77	0
STORAGE LIFE	0541	DS2780	QK547674	150C	1000 HRS	76	0
WRITE CYCLE STRESS (KCYS)	0640	DS2756	QK621609	70 C, 5.5 VOLTS	50 KCYS	77	0
STORAGE LIFE	0640	DS2756	QK621609	150C	1000 HRS	77	0
WRITE CYCLE STRESS (KCYS)	0642	<b>DS2786</b>	QJ652645A	50 C, 5.5 VOLTS (PSA), 15.0 VOLTS (PSB)	10 KCYS	77	0
STORAGE LIFE	0642	<b>DS2786</b>	QJ652645A	150C	1000 HRS	77	0

WRITE CYCLE STRESS (KCYS)	0642	<b>DS2786</b>	QJ652645A	50 C, 5.5 VOLTS (PSA), 15.0 VOLTS (PSB)	1	KCYS	77	0
STORAGE LIFE	0642	<b>DS2786</b>	QJ652645A	150C	1000	HRS	77	0
WRITE CYCLE STRESS (CYS)	0642	<b>DS2786</b>	QJ652645A	50 C, 5.5 VOLTS (PSA), 15.0 VOLTS (PSB)	100	CYS	77	0
STORAGE LIFE	0642	<b>DS2786</b>	QJ652645A	150C	1000	HRS	77	0
WRITE CYCLE STRESS (KCYS)	0714	DS2784	QJ714637A	50 C, 5.5 V (PSA) & 15.0 V (PSB)	50	KCYS	77	0
STORAGE LIFE	0714	DS2784	QJ714637A	150C	1000	HRS	77	0
WRITE CYCLE STRESS (KCYS)	0732	DS2784	QJ738201B	50 C, 5.5 V (PSA) & 15.0 V (PSB)	50	KCYS	77	0
STORAGE LIFE	0732	DS2784	QJ738201B	150C	1000	HRS	77	0
WRITE CYCLE STRESS (KCYS)	0736	DS2788	QK718177	50 C, 5.5 VOLTS	50	KCYS	77	0
STORAGE LIFE	0736	DS2788	QK718177	150C	1000	HRS	77	0
					<b>Total:</b>			<b>0</b>
<b>FAILURE RATE:</b>		<b>MTTF (YRS):</b>	<b>102346</b>	<b>FITS:</b>	<b>1.1</b>			
		<b>DEVICE HOURS:</b>	<b>871000</b>	<b>FAILS:</b>	<b>0</b>			