



PRODUCT RELIABILITY REPORT
FOR

MAX31785

January 17, 2017

MAXIM INTEGRATED

**160 Rio Robles
San Jose, CA 95134**

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Conclusion:

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

MAX31785

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):** **165109** **FITS:** **0.7**
DEVICE HOURS: **1325278729** **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. **Bold** Product Number denotes specific product data.

Device Information:

Process: TSMC 0.18um Logic General Purpose 1P6M Salicide 1.8V/3.3V
Passivation: Passivation w/Nitride
Die Size: 131 x 108
Number of Transistors: 589348
Interconnect: Aluminum / 0.5% Copper
Gate Oxide Thickness: 32 Å

ESD HBM

DESCRIPTION	DATE CODE/PRODUCT/LOT	CONDITION	READPOIN	QTY	FAILS	FA#
ESD SENSITIVITY	1129 MAX34440 ZJ112013CC	JESD22-A114 HBM 500 VOLTS	1 PUL'S	5	0	
ESD SENSITIVITY	1129 MAX34440 ZJ112013CC	JESD22-A114 HBM 1000 VOLTS	1 PUL'S	5	0	
ESD SENSITIVITY	1129 MAX34440 ZJ112013CC	JESD22-A114 HBM 1500 VOLTS	1 PUL'S	5	0	
ESD SENSITIVITY	1129 MAX34440 ZJ112013CC	JESD22-A114 HBM 2000 VOLTS	1 PUL'S	5	0	
ESD SENSITIVITY	1129 MAX34440 ZJ112013CC	JESD22-A114 HBM 2500 VOLTS	1 PUL'S	5	0	
Total:					0	

LATCH-UP

DESCRIPTION	DATE CODE/PRODUCT/LOT	CONDITION	READPOIN	QTY	FAILS	FA#
LATCH-UP I	1129 MAX34440 ZJ112013CC	JESD78A, I-TEST 25C 100mA		6	0	
LATCH-UP V	1129 MAX34440 ZJ112013CC	JESD78A, V-SUPPLY TEST 25C		6	0	
Total:					0	

OPERATING LIFE

DESCRIPTION	DATE CODE/PRODUCT/LOT	CONDITION	READPOIN	QTY	FAILS	FA#
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HIGH TEMP OP LIFE	0744	DS33X162	QK075519BA	125C, 2.0V (PSB) & 3.5V (PSA)	1000	HRS	45	0
HIGH TEMP OP LIFE	0804	DS34T104	QL075523BD	125C, 3.5V (PSA) & 2.0V (PSB)	1000	HRS	45	0
HIGH TEMP OP LIFE	0808	DS34T102	QL075523BF	125C, 3.5V (PSA) & 2.0V (PSB)	1000	HRS	45	0
HIGH TEMP OP LIFE	0810	DS26518	QG073727B	125C, 2.0V (PSB) & 3.5V (PSA)	1000	HRS	45	0
HIGH TEMP OP LIFE	0810	DS26518	QG073727BL	125C, 2.0V (PSB) & 3.5V (PSA)	1000	HRS	45	0
HIGH TEMP OP LIFE	0810	DS26518	QG073727BJ	125C, 2.0V (PSB) & 3.5V (PSA)	1000	HRS	45	0
HIGH TEMP OP LIFE	0824	DS34T108	QN085617A	125C, 2.0V (PSB) & 3.5V (PSA)	1000	HRS	45	0
HIGH TEMP OP LIFE	0825	DS33X42	QK089099A	125C, 2.0V (PSB) & 3.5V (PSA)	1000	HRS	45	0
HIGH TEMP OP LIFE	0826	DS33X41	QK089099AB	125C, 2.0V (PSB) & 3.5V (PSA)	1000	HRS	45	0
HIGH TEMP OP LIFE	0826	DS33X81	QK089099A	125C, 2.0V (PSB) & 3.5V (PSA)	1000	HRS	45	0
HIGH TEMP OP LIFE	0831	DS33M33	QG095632A	125C, 2.0V (PSB) & 3.5V (PSA)	1000	HRS	45	0
HIGH TEMP OP LIFE	0831	DS33R41	QK080847AJ	125C, 2.0V (PSB) & 3.5V (PSA)	1000	HRS	45	0
HIGH TEMP OP LIFE	0831	DS33R41	QK080847AK	125C, 2.0V (PSB) & 3.5V (PSA)	1000	HRS	45	0
HIGH TEMP OP LIFE	0831	DS33R41	QK080847AI	125C, 2.0V (PSB) & 3.5V (PSA)	1000	HRS	45	0
HIGH TEMP OP LIFE	0842	DS3102	QX085545A	125C, 3.5V (PSA) & 2.0V (PSB)	1000	HRS	45	0
HIGH TEMP OP LIFE	0842	DS3104	QX085545AF	125C, 3.5V (PSA) & 2.0V (PSB)	1000	HRS	25	0
HIGH TEMP OP LIFE	0843	DS3102	QX085545AE	125C, 3.5V (PSA) & 2.0V (PSB)	1000	HRS	25	0
HIGH TEMP OP LIFE	0848	DS34T102	QX096583A	125C, 2.0V (PSB) & 3.5V (PSA)	1000	HRS	45	0
HIGH TEMP OP LIFE	0848	DS34T102	QX096583A	125C, 2.0V (PSB) & 3.5V (PSA)	1000	HRS	45	0
HIGH TEMP OP LIFE	0848	DS34T101	QX096583AB	125C, 2.0V (PSB) & 3.5V (PSA)	1000	HRS	45	0
HIGH TEMP OP LIFE	0852	MAXQ1850	QJ091074AA	125C, 3.6 VOLTS	192	HRS	75	0
HIGH TEMP OP LIFE	0906	MAXQ61H	QJ091049AB	125C, 3.6 VOLTS	192	HRS	45	0
HIGH TEMP OP LIFE	0907	DS34S132	QX096061BB	125C, 2.0V (PSB) & 3.5V (PSA)	1000	HRS	43	0
HIGH TEMP OP LIFE	0933	DS34S132	QX096061B	125C, 2.0V (PSB) & 3.5V (PSA)	1000	HRS	43	0

HIGH TEMP OP LIFE	0933	DS34S132	QX096061BA	125C, 2.0V (PSB) & 3.5V (PSA)	1000	HRS	43	0
HIGH TEMP OP LIFE	0946	MAXQ622	QN091481C	125C, 3.6V (PSA) & 5.5V (PSB)	192	HRS	77	0
HIGH TEMP OP LIFE	0951	DS26514	QX108235AB	125C, 2.0V (PSB) & 3.5V (PSA)	1000	HRS	45	0
HIGH TEMP OP LIFE	0951	MAXQ61C	QJ101202AC	125C, 3.6 VOLTS	192	HRS	45	0
HIGH TEMP OP LIFE	0953	DS26514	QX108235A	125C, 2.0V (PSB) & 3.5V (PSA)	1000	HRS	45	0
HIGH TEMP OP LIFE	0953	DS26514	QX108235A	125C, 2.0V (PSB) & 3.5V (PSA)	1000	HRS	45	0
HIGH TEMP OP LIFE	1006	MAXQ1004	QS101775AB	125C, 3.6V (PSA) & 5.0V (PSB)	192	HRS	45	0
HIGH TEMP OP LIFE	1007	MAX72408	QN101492A	125C, 3.3 VOLTS	192	HRS	48	0
HIGH TEMP OP LIFE	1011	MAXQ3103	QJ101246AB	125C, 3.6 VOLTS	192	HRS	48	0
HIGH TEMP OP LIFE	1011	MAXQ3103	QJ101246AB	125C, 3.6 VOLTS	1000	HRS	77	0
HIGH TEMP OP LIFE	1018	DS31400	QZ106781AB	125C, 2.0V (PSA) & 3.5V (PSB)	192	HRS	45	0
HIGH TEMP OP LIFE	1024	MAXQ1010	QJ101790AG	125C, 5.5V (PS1) & 3.6V (PS2)	192	HRS	45	0
HIGH TEMP OP LIFE	1024	MAX31782	QJ102013AC	125C, 5.5 VOLTS	192	HRS	45	0
HIGH TEMP OP LIFE	1029	DS28E500	QD101882B	125C, 20V (PSA), -10V (PSB)	1000	HRS	77	0
HIGH TEMP OP LIFE	1030	MAXQ613	QJ101861CH	135C, 3.6 V (PSA)	192	HRS	45	0
HIGH TEMP OP LIFE	1036	DS28E500	QD112114B	125C, 20V (PSA), -10V (PSB)	1000	HRS	77	0
HIGH TEMP OP LIFE	1050	MAXQ6831	ZN112250BC	125C, 3.6V (PSA), 1.89V (PSB) & 2.94V (PSD)	1000	HRS	48	0
HIGH TEMP OP LIFE	1111	MAXQ618	ZJ112624AD	125C, 3.6 VOLTS	192	HRS	48	0
HIGH TEMP OP LIFE	1119	MAXQ1740	ZJ112746BA	125C, 3.6 VOLTS	192	HRS	48	0
HIGH TEMP OP LIFE	1120	DS4830	ZS112802AC	125C, 3.3 VOLTS	192	HRS	77	
HIGH TEMP OP LIFE	1134	MAXQ1050	ZS123062AB	125C, 5.5V (PSA) & 3.6V (PSB)	192	HRS	48	0
Total:							0	
FAILURE RATE:	MTTF (YRS):		165109	FITS:	0.7			
	DEVICE HOURS:		1325278729	FAILS:	0			