9/9/2013

PRODUCT RELIABILITY REPORT
FOR

DS24L65

Maxim Integrated

14460 Maxim Dr.
Dallas, TX 75244

Approved by:

Don Lipps
Manager, Reliability Engineering

Conclusion:

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

DS24L65

In addition, Maxim Integrated'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.maximintegrated.com/qa/reliability/monitor.

Device Description:

A description of this device can be found in the product data sheet. You can find the product data sheet at http://www.maximintegrated.com/search/parts.mvp.

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): 303520 FITS: 0.4

DEVICE HOURS: 2436261019 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: 3.6 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 Mixed signal, General Purpose, Single poly Six metal, 1.8V/3.3V
Passivation:	SiO/SiN
Die Size:	70 x 36
Number of Transistors:	20000
Interconnect:	Aluminum / 0.5% Copper
Gate Oxide Thickness:	32 Å

ESD HBM

DESCRIPTION	DATE CODE/PRODUCT/LOT			CONDITION	READPOIN		QTY	FAILS	FA#
ESD SENSITIVITY	1319	**DS2465**	ZH133311AC	JESD22-A114 HBM 500 VOLTS	1	PUL'S	5	0	
ESD SENSITIVITY	1319	**DS2465**	ZH133311AC	JESD22-A114 HBM 1000 VOLTS	1	PUL'S	5	0	
ESD SENSITIVITY	1319	**DS2465**	ZH133311AC	JESD22-A114 HBM 2000 VOLTS	1	PUL'S	5	0	
ESD SENSITIVITY	1319	**DS2465**	ZH133311AC	JESD22-A114 HBM 4000 VOLTS	1	PUL'S	5	0	
ESD SENSITIVITY	1319	**DS2465**	ZH133311AC	JESD22-A114 HBM 8000 VOLTS	1	PUL'S	5	0	
					Total:			**0**	

LATCH-UP

DESCRIPTION	DATE CODE/PRODUCT/LOT			CONDITION	READPOIN	QTY	FAILS	FA#
LATCH-UP I	1319	**DS2465**	ZH133311AC	JESD78A, I-TEST 25C 100mA		6	0	
LATCH-UP I	1319	**DS2465**	ZH133311AC	JESD78A, I-TEST 25C 250mA		6	0	
LATCH-UP	1319	**DS2465**	ZH133311AC	JESD78, V-SUPPLY TEST 25C		6	0	
					Total:		**0**	

OPERATING LIFE

DESCRIPTION	DATE CODE/PRODUCT/LOT			CONDITION	READPOIN	QTY	FAILS	FA#
HIGH TEMP OP LIFE	0429	DS33Z44	QK561458B	125C, 3.5V (PSA) & 2.0V (PSB)	1000 HRS	45	0	
HIGH TEMP OP LIFE	0452	DS31612	QR561723B	125C, 3.5V (PSA) & 2.0V (PSB)	1000 HRS	45	0	
HIGH TEMP OP LIFE	0520	DS33Z44	QK561458B	125C, 3.5V (PSA) & 2.0V (PSB)	1000 HRS	45	0	
HIGH TEMP OP LIFE	0521	DS33Z44	IK561952AB	125C, 3.5V (PSA) & 2.0V (PSB)	1000 HRS	45	0	
HIGH TEMP OP LIFE	0523	DS33ZH11	QK561952A	125C, 3.5V (PSA) & 2.0V (PSB)	1000 HRS	45	0	
HIGH TEMP OP LIFE	0527	DS31612	QR561723B	125C, 3.5V (PSA) & 2.0V (PSB)	1000 HRS	45	0	
HIGH TEMP OP LIFE	0536	DS33R41	QK561458C	125C, 3.5V (PSA) & 2.0V (PSB)	1000 HRS	45	0	
HIGH TEMP OP LIFE	0607	DS3100	QK062588B	125C, 3.5V (PSA) & 2.0V (PSB)	1000 HRS	45	0	
HIGH TEMP OP LIFE	0625	DS32512	QK062588AB	125C, 2.0V (PSA) & 3.5V (PSB)	1000 HRS	45	0	
HIGH TEMP OP LIFE	0642	DS32504	QL064723AB	125C, 2.0V (PSA) & 3.5V (PSB)	1000 HRS	45	0	
HIGH TEMP OP LIFE	0647	DS26519	QN062959BF	125C, 2.0V (PSB) & 3.5V (PSA)	1000 HRS	45	0	
HIGH TEMP OP LIFE	0648	DS34T108	QN074782A	125C, 2.0V (PSB) & 3.5V (PSA)	1000 HRS	45	0	
HIGH TEMP OP LIFE	0649	DS33X162	QK076138A	125C, 2.0V (PSB) & 3.5V (PSA)	1000 HRS	45	0	
HIGH TEMP OP LIFE	0705	DS3104	QC076354B	125C, 3.5V (PSA) & 2.0V (PSB)	1000 HRS	45	0	
HIGH TEMP OP LIFE	0705	DS3100	QK073291BB	125C, 3.5V (PSA) & 2.0V (PSB)	1000 HRS	48	0	
HIGH TEMP OP LIFE	0706	DS33R41	QK562042AJ	125C, 3.5V (PSA) & 2.0V (PSB)	1000 HRS	45	0	
HIGH TEMP OP LIFE	0708	DS32512	QK073291B	125C, 2.0V (PSA) & 3.5V (PSB)	1000 HRS	45	0	
HIGH TEMP OP LIFE	0709	DS26519	QN062959A	125C, 2.0V (PSB) & 3.5V (PSA)	1000 HRS	48	0	
HIGH TEMP OP LIFE	0720	DS26519	QN076204B	125C, 2.0V (PSB) & 3.5V (PSA)	1000 HRS	45	0	
HIGH TEMP OP LIFE	0731	DS3104	QC073632B	125C, 3.5V (PSA) & 2.0V (PSB)	1000 HRS	45	0	
HIGH TEMP OP LIFE	0743	DS32506	QK074592A	125C, 2.0V (PSA) & 3.5V (PSB)	1000 HRS	45	0	
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	0837	MAX2990	QN096322A	125C, 3.6V (PSA) & 2.0V (PSB)	1000	HRS	77	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	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	0951	DS26514	QX108235AB	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	0953	DS26514	QX108235A	125C, 2.0V (PSB) & 3.5V (PSA)	1000	HRS	45	0
HIGH TEMP OP LIFE	1007	MAX72408	QN101492A	125C, 3.3 VOLTS	192	HRS	48	0
HIGH TEMP OP LIFE	1018	DS31400	QZ106781AB	125C, 2.0V (PSA) & 3.5V (PSB)	192	HRS	45	0
HIGH TEMP OP LIFE	1024	MAX31782	QJ102013AC	125C, 5.5 VOLTS	192	HRS	45	0
HIGH TEMP OP LIFE	1029	MAX28500	QD101882B	125C, 20 V (PSA), -10 V (PSB)	1000	HRS	77	0
HIGH TEMP OP LIFE	1036	MAX28500	QD112114B	125C, 20 V (PSA), -10 V (PSB)	1000	HRS	77	0
HIGH TEMP OP LIFE	1120	DS4830	ZS112802AC	125C, 3.3 VOLTS	192	HRS	77	0
HIGH TEMP OP LIFE	1143	DSK1	ZJ122300AB	125C, 5.25 VOLTS	192	HRS	77	0
HIGH TEMP OP LIFE	1145	MAX24310	ZX121447AF	125C, 3.6V (PSA) & 1.9V (PSB)	192	HRS	77	0
HIGH TEMP OP LIFE	1150	DSKCP1	ZJ122416DA	125C, 3.6 VOLTS	192	HRS	77	0
HIGH TEMP OP LIFE	1151	MAX28500	ZJ122988AA	125C, 20 V (PSA), -10 V (PSB)	1000	HRS	77	0
HIGH TEMP OP LIFE	1218	DS28E25	ZH122643EA	125C, 3.6 VOLTS	192	HRS	77	0
HIGH TEMP OP LIFE	1219	MAX34451	ZJ133319BC	125C, 3.6 VOLTS	192	HRS	80	0
HIGH TEMP OP LIFE	1220	MAX71020	ZK123187CB	125C, 3.6 VOLTS	480	HRS	80	0
HIGH TEMP OP LIFE	1243	DS28E05	ZH132976DB	125C, 3.6 VOLTS	192	HRS	80	0
HIGH TEMP OP LIFE	1305	DS28C22	ZH133205AB	125C, 3.6 VOLTS	192	HRS	79	0
HIGH TEMP OP LIFE	1319	**DS2465**	ZH133311AC	125C, 3.6 VOLTS	192	HRS	80	0
					Total:			**0**

FAILURE RATE: **MTTF (YRS): 303520** **FITS: 0.4**

DEVICE HOURS: 2436261019 **FAILS: 0**

For 8KV HBM ESD only the I/O and GND pins were included in the stressing. DS2465 qualifies both DSKCP1 and DS24L65 by extension since they share the same die.