

RELIABILITY REPORT
FOR

DS31256, Rev B2

Dallas Semiconductor

4401 South Beltwood Parkway
Dallas, TX 75244-3292

Prepared by:

Ken Wendel

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 and processes:

DS31256, Rev B2

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): 31776** **FITS: 3.6**

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.

Device Information:

Process: 1P, 4M,0.35um, Sil.P1, Ti/TiN M1-M4 ,BPSG,Masked N+ES
 Passivation: Passivation w/Nov TEOS Oxide-Nitride
 Die Size: 467 x 464
 Number of Transistors: 0
 Interconnect: Aluminum / 1% Silicon / 0.5% Copper
 Gate Oxide Thickness: 75 Å

ELECTRICAL CHARACTERIZATION

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
ESD SENSITIVITY	0231	EOS/ESD S5.1 HBM 500 VOLTS	1 PUL'S	3	0
ESD SENSITIVITY	0231	EOS/ESD S5.1 HBM 1000 VOLTS	1 PUL'S	3	0
ESD SENSITIVITY	0231	EOS/ESD S5.1 HBM 2000 VOLTS	1 PUL'S	3	0
ESD SENSITIVITY	0231	EOS/ESD S5.1 HBM 4000 VOLTS	1 PUL'S	3	3
ESD SENSITIVITY	0231	EOS/ESD S5.1 HBM 8000 VOLTS	1 PUL'S	3	3
LATCH-UP	0231	JESD78, I-TEST 125C		3	0
LATCH-UP	0231	JESD78, Vsupply TEST 125C		3	0
ESD SENSITIVITY	0320	EOS/ESD S5.1 HBM 500 VOLTS	1 PUL'S	3	0
ESD SENSITIVITY	0320	EOS/ESD S5.1 HBM 1000 VOLTS	1 PUL'S	3	0
ESD SENSITIVITY	0320	EOS/ESD S5.1 HBM 1500 VOLTS	1 PUL'S	3	0
ESD SENSITIVITY	0320	EOS/ESD S5.1 HBM 2000 VOLTS	1 PUL'S	3	0
LATCH-UP	0320	JESD78, I-TEST 125C		6	0
LATCH-UP	0320	JESD78, Vsupply TEST 125C		6	0
Total:					6

OPERATING LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
HIGH VOLTAGE LIFE	0026	125C, 3.5 VOLTS	1000 HRS	143	1
INFANT LIFE	0042	125C, 3.5 VOLTS	48 HRS	269	0
HIGH VOLTAGE LIFE	0042	125C, 3.5 VOLTS	2000 HRS	157	1

HIGH VOLTAGE LIFE	0109	125C, 3.5 VOLTS	1000 HRS	80	0
HIGH VOLTAGE LIFE	0143	125C, 3.5 VOLTS	336 HRS	77	0
HIGH VOLTAGE LIFE	0152	125C, 3.5 VOLTS	1000 HRS	80	0
HIGH VOLTAGE LIFE	0224	125C, 3.5 VOLTS	1000 HRS	45	0
HIGH VOLTAGE LIFE	0230	125C, 3.5 VOLTS	1000 HRS	77	0
HIGH VOLTAGE LIFE	0231	125C, 3.5 VOLTS	1000 HRS	77	0
HIGH VOLTAGE LIFE	0244	125C, 3.5 VOLTS	1000 HRS	45	0
HIGH VOLTAGE LIFE	0244	125C, 3.5 VOLTS	192 HRS	42	0
HIGH VOLTAGE LIFE	0320	125C, 3.5 VOLTS	192 HRS	45	0
				Total:	2

STORAGE LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
STORAGE LIFE	0224	150C	1000 HRS	77	0
STORAGE LIFE	0244	150C	1000 HRS	75	0
STORAGE LIFE	0244	150C	1000 HRS	77	0
				Total:	0

TEMPERATURE CYCLE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
TEMP CYCLE	0026	-55C TO 125C	1000 CYS	70	0
TEMP CYCLE	0042	-55C TO 125C	1000 CYS	77	0
TEMP CYCLE	0224	-55C TO 125C	1000 CYS	77	0
TEMP CYCLE	0244	-55C TO 125C	1000 CYS	77	0
TEMP CYCLE	0244	-55C TO 125C	1000 CYS	77	0
				Total:	0

TEMPERATURE HUMIDITY BIAS

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
BIASED MOISTURE	0042	85/85, 3.5 VOLTS	959 HRS	29	0
BIASED MOISTURE	0224	85/85, 3.5 VOLTS	1000 HRS	45	0
BIASED MOISTURE	0244	85/85, 3.5 VOLTS	1000 HRS	45	0
				Total:	0

UNBIASED MOISTURE RESISTANCE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
MOISTURE SOAK	0026	85 C/85% R.H.	959 HRS	38	0
MOISTURE SOAK	0244	85 C/85% R.H.	1000 HRS	77	0
				Total:	0

FAILURE RATE:

MTTF (YRS): 31776

FITS: 3.6