

RELIABILITY REPORT
FOR

DS1867

Dallas Semiconductor

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Prepared by:

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Conclusion:

The following qualification successfully meets the quality and reliability standards required of all Dallas Semiconductor products and processes:

DS1867

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): 49462** **FITS: 2.3**

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.

Device Information:

Process: 1P, 1M, 1.2um,E2PROM,N&PdeplUVII,SBC Vt,noHVNchs,Tps,N+ESD,
 Passivation: Passivation w/Nov TEOS Oxide-Nitride
 Die Size: 102 x 138
 Number of Transistors: 10113
 Interconnect: Aluminum / 1% Silicon / 0.5% Copper
 Gate Oxide Thickness: 225 Å

OPERATING LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
INFANT LIFE	9503	125C, 7.0 V & -4.0 V	48 HRS	231	0
HIGH VOLTAGE LIFE	9503	125C, 7.0 V & -4.0 V	1000 HRS	77	2
INFANT LIFE	9505	125C, 7.0 VOLTS	48 HRS	228	0
HIGH VOLTAGE LIFE	9505	125C, 7.0 VOLTS	1000 HRS	151	0
INFANT LIFE	9505	125C, 7.0 VOLTS	48 HRS	75	0
INFANT LIFE	9542	125C, 7.0 VOLTS	48 HRS	230	1
HIGH VOLTAGE LIFE	9542	125C, 7.0 VOLTS	1000 HRS	153	0
INFANT LIFE	9615	125C, 7.0 VOLTS	48 HRS	231	0
HIGH VOLTAGE LIFE	9615	125C, 7.0 VOLTS	1000 HRS	77	0
INFANT LIFE	9620	125C, 7.0 VOLTS	48 HRS	304	0
HIGH TEMP OP LIFE	9620	125C, 5.5 VOLTS	1000 HRS	116	0
INFANT LIFE	9621	125C, 7.0 VOLTS	48 HRS	231	1
HIGH VOLTAGE LIFE	9621	125C, 7.0 VOLTS	1000 HRS	77	0
INFANT LIFE	9639	125C, 7.0 VOLTS	48 HRS	229	0
HIGH VOLTAGE LIFE	9639	125C, 7.0 VOLTS	1000 HRS	77	0
INFANT LIFE	9642	125C, 7.0 VOLTS	48 HRS	226	0
HIGH VOLTAGE LIFE	9642	125C, 7.0 VOLTS	1000 HRS	77	0
INFANT LIFE	9701	125C, 7.0 VOLTS	48 HRS	230	0

HIGH VOLTAGE LIFE	9701	125C, 7.0 VOLTS	1000 HRS	77	0
INFANT LIFE	9702	125C, 7.0 VOLTS	48 HRS	392	0
HIGH VOLTAGE LIFE	9702	125C, 7.0 VOLTS	1000 HRS	116	0
INFANT LIFE	9706	125C, 7.0 VOLTS	48 HRS	231	0
HIGH VOLTAGE LIFE	9706	125C, 7.0 VOLTS	1000 HRS	77	0
INFANT LIFE	9706	125C, 7.0 VOLTS	48 HRS	229	0
HIGH VOLTAGE LIFE	9706	125C, 7.0 VOLTS	1000 HRS	77	0
INFANT LIFE	9720	125C, 7.0 VOLTS	48 HRS	231	0
HIGH VOLTAGE LIFE	9720	125C, 7.0 VOLTS	1000 HRS	77	0
INFANT LIFE	9727	125C, 7.0 VOLTS	48 HRS	230	0
HIGH VOLTAGE LIFE	9727	125C, 7.0 VOLTS	1000 HRS	77	0
INFANT LIFE	9740	125C, 7.0 VOLTS	48 HRS	237	0
HIGH VOLTAGE LIFE	9740	125C, 7.0 VOLTS	1000 HRS	77	0
INFANT LIFE	9744	125C, 7.0 VOLTS	48 HRS	232	0
HIGH VOLTAGE LIFE	9744	125C, 7.0 VOLTS	1000 HRS	77	0
HIGH VOLTAGE LIFE	9825	125C, 7.0 VOLTS	1000 HRS	116	0
HIGH VOLTAGE LIFE	9829	125C, 7.0 VOLTS	1000 HRS	116	0
INFANT LIFE	9829	125C, 7.0 VOLTS	48 HRS	237	0
HIGH VOLTAGE LIFE	9829	125C, 7.0 VOLTS	1000 HRS	77	0
INFANT LIFE	9836	125C, 7.0 VOLTS	48 HRS	230	0
HIGH VOLTAGE LIFE	9836	125C, 7.0 VOLTS	1000 HRS	70	0
HIGH VOLTAGE LIFE	9844	125C, 7.0 V & -4.0 V	1000 HRS	179	0
INFANT LIFE	9907	125C, 7.0 VOLTS	48 HRS	231	0
HIGH VOLTAGE LIFE	9907	125C, 7.0 VOLTS	1000 HRS	75	0
INFANT LIFE	0017	125C, 7.0 VOLTS	48 HRS	236	0
HIGH VOLTAGE LIFE	0017	125C, 7.0 VOLTS	1000 HRS	76	0
				Total:	4

STORAGE LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
STORAGE LIFE	9505	150C	1000 HRS	75	0
STORAGE LIFE	9542	150C	1000 HRS	77	0
STORAGE LIFE	9615	150C	1000 HRS	38	0
STORAGE LIFE	9621	150C	1000 HRS	38	0
STORAGE LIFE	9642	150C	1000 HRS	38	0
STORAGE LIFE	9701	150C	1000 HRS	38	0
STORAGE LIFE	9702	150C	1000 HRS	77	0
STORAGE LIFE	9706	150C	1000 HRS	38	1

STORAGE LIFE	9740	150C	1000 HRS	49	0
STORAGE LIFE	9744	150C	1000 HRS	38	0
STORAGE LIFE	9829	150C	1000 HRS	50	0
STORAGE LIFE	9836	150C	1000 HRS	50	0
STORAGE LIFE	9836	150C	1000 HRS	136	0
STORAGE LIFE	9844	150C	1000 HRS	76	0
STORAGE LIFE	9907	150C	1000 HRS	46	0
				Total:	1

W/E ENDURANCE AND DATA RET'N

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
WRITE CYCLE STRESS	0017	85 C, 7.0 VOLTS	25 KCYS	48	0
STORAGE LIFE		150C	1000 HRS	46	0
				Total:	0

WRITE CYCLE STRESS

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
WRITE CYCLE STRESS	9505	70 C, 7.0 VOLTS	50 KCYS	75	0
WRITE CYCLE STRESS	9542	85 C, 7.0 VOLTS	50 KCYS	77	0
WRITE CYCLE STRESS	9740	85 C, 7.0 VOLTS	50 KCYS	50	0
WRITE CYCLE STRESS	9829	85 C, 7.0 VOLTS	25 KCYS	50	0
WRITE CYCLE STRESS	9836	85 C, 7.0 VOLTS	25 KCYS	50	0
WRITE CYCLE STRESS	9836	85 C, 7.0 VOLTS	25 KCYS	136	0
WRITE CYCLE STRESS	9844	85 C, 6.0 V (PSA); -5.5V (PSB)	12 KCYS	77	0
WRITE CYCLE STRESS	9907	85 C, 7.0 VOLTS	25 KCYS	46	0
				Total:	0

FAILURE RATE: **MTTF (YRS): 49462** **FITS: 2.3**

Failure explanation by date code. 9503 - 1 gate oxide defect & 1 unknown. 9542 - gate oxide defect. 9621 - lcc failure in F/A but not worked. 9706 - Data retention failure in F/A but not worked.