

RELIABILITY REPORT
FOR

DS232, Rev B3

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:

DS232, Rev B3

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): 231951** **FITS: 0.5**

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, 5.0um, 30V NF & PF, UVNd, UVPd ,N+ESD,TEOS Spacer,
 Passivation: Passivation w/Nov TEOS Oxide-Nitride
 Die Size: 83 x 126
 Number of Transistors: 0
 Interconnect: Aluminum / 1% Silicon / 0.5% Copper
 Gate Oxide Thickness: 225 Å

OPERATING LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
INFANT LIFE	9512	125C, 7.0 VOLTS	48 HRS	193	0
HIGH VOLTAGE LIFE	9512	125C, 7.0 VOLTS	1000 HRS	116	0
INFANT LIFE	9515	125C, 7.0 VOLTS	48 HRS	270	0
HIGH VOLTAGE LIFE	9515	125C, 7.0 VOLTS	1000 HRS	116	0
INFANT LIFE	9519	125C, 7.0 VOLTS	48 HRS	231	0
HIGH VOLTAGE LIFE	9519	125C, 7.0 VOLTS	1000 HRS	77	0
INFANT LIFE	9520	125C, 7.0 VOLTS	48 HRS	231	0
HIGH VOLTAGE LIFE	9520	125C, 7.0 VOLTS	1000 HRS	77	0
INFANT LIFE	9613	125C, 7.0 VOLTS	48 HRS	231	0
HIGH VOLTAGE LIFE	9613	125C, 7.0 VOLTS	1000 HRS	77	0
INFANT LIFE	9613	125C, 7.0 VOLTS	48 HRS	231	0
HIGH VOLTAGE LIFE	9613	125C, 7.0 VOLTS	1000 HRS	77	0
HIGH VOLTAGE LIFE	9631	125C, 7.0 VOLTS	1000 HRS	153	0
INFANT LIFE	9639	125C, 7.0 VOLTS	48 HRS	231	0
HIGH VOLTAGE LIFE	9639	125C, 7.0 VOLTS	1000 HRS	77	0
INFANT LIFE	9652	125C, 7.0 VOLTS	48 HRS	315	0
HIGH TEMP OP LIFE	9652	125C, 5.5 VOLTS	1000 HRS	116	0
INFANT LIFE	9702	125C, 7.0 VOLTS	48 HRS	231	0

HIGH VOLTAGE LIFE	9702	125C, 7.0 VOLTS	1000 HRS	77	0
INFANT LIFE	9719	125C, 7.0 VOLTS	48 HRS	231	0
HIGH VOLTAGE LIFE	9719	125C, 7.0 VOLTS	1000 HRS	77	0
INFANT LIFE	9719	125C, 7.0 VOLTS	48 HRS	231	0
HIGH VOLTAGE LIFE	9719	125C, 7.0 VOLTS	1000 HRS	77	0
INFANT LIFE	9724	125C, 7.0 VOLTS	48 HRS	315	0
HIGH TEMP OP LIFE	9724	125C, 5.5 VOLTS	1000 HRS	116	0
INFANT LIFE	9732	125C, 7.0 VOLTS	48 HRS	352	0
HIGH VOLTAGE LIFE	9732	125C, 7.0 VOLTS	1000 HRS	153	0
INFANT LIFE	9742	125C, 7.0 VOLTS	48 HRS	234	0
HIGH VOLTAGE LIFE	9742	125C, 7.0 VOLTS	1000 HRS	77	0
INFANT LIFE	9809	125C, 7.0 VOLTS	48 HRS	234	0
HIGH VOLTAGE LIFE	9809	125C, 7.0 VOLTS	1000 HRS	77	0
INFANT LIFE	9809	125C, 7.0 VOLTS	48 HRS	234	0
HIGH VOLTAGE LIFE	9809	125C, 7.0 VOLTS	1000 HRS	77	0
INFANT LIFE	9809	125C, 7.0 VOLTS	48 HRS	234	0
HIGH VOLTAGE LIFE	9809	125C, 7.0 VOLTS	1000 HRS	77	0
INFANT LIFE	9809	125C, 7.0 VOLTS	48 HRS	234	0
HIGH VOLTAGE LIFE	9809	125C, 7.0 VOLTS	1000 HRS	77	0
HIGH TEMP OP LIFE	0328	125C, 5.5 VOLTS	1000 HRS	77	0
				Total:	0

STORAGE LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
STORAGE LIFE	0328	150C	1000 HRS	77	0
				Total:	0

TEMPERATURE CYCLE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
TEMP CYCLE	9512	-55C TO 125C	1000 CYS	77	0
TEMP CYCLE	9515	-55C TO 125C	1000 CYS	77	0
TEMP CYCLE	9519	-55C TO 125C	1000 CYS	39	0
TEMP CYCLE	9520	-55C TO 125C	1000 CYS	39	0
TEMP CYCLE	9613	-55C TO 125C	1000 CYS	39	0
TEMP CYCLE	9613	-55C TO 125C	1000 CYS	39	0
TEMP CYCLE	9639	-55C TO 125C	1000 CYS	39	0
TEMP CYCLE	9652	-55C TO 125C	1000 CYS	75	0
TEMP CYCLE	9702	-55C TO 125C	1000 CYS	38	0
TEMP CYCLE	9719	-55C TO 125C	1000 CYS	39	0
TEMP CYCLE	9719	-55C TO 125C	1000 CYS	39	0
TEMP CYCLE	9724	-55C TO 125C	1000 CYS	77	0

TEMP CYCLE	9732	-55C TO 125C	1000	CYS	76	0
TEMP CYCLE	9742	-55C TO 125C	1000	CYS	40	0
TEMP CYCLE	9809	-55C TO 125C	1000	CYS	40	0
TEMP CYCLE	9809	-55C TO 125C	1000	CYS	40	0
TEMP CYCLE	9809	-55C TO 125C	1000	CYS	40	0
TEMP CYCLE	0328	-55C TO 125C	1000	CYS	77	0
					Total:	0

TEMPERATURE HUMIDITY BIAS

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS	
BIASED MOISTURE	9515	85/85, 5.5 VOLTS	959 HRS	77	0	
HAST	9519	120C, 85%R.H.,5.5V	100 HRS	77	0	
HAST	9520	120C, 85%R.H.,5.5V	100 HRS	77	0	
HAST	9613	120C, 85%R.H.,5.5V	100 HRS	77	0	
HAST	9613	120C, 85%R.H.,5.5V	100 HRS	77	0	
HAST	9639	120C, 85%R.H.,5.5V	100 HRS	77	0	
HAST	9652	120C, 85%R.H.,5.5V	100 HRS	77	0	
HAST	9702	120C, 85%R.H.,5.5V	100 HRS	77	0	
BIASED MOISTURE	9719	85/85, 5.5 VOLTS	959 HRS	77	0	
BIASED MOISTURE	9719	85/85, 5.5 VOLTS	959 HRS	77	0	
BIASED MOISTURE	9724	85/85, 5.5 VOLTS	959 HRS	77	0	
HAST	9732	120C, 85%R.H.,5.5V	100 HRS	77	0	
BIASED MOISTURE	9742	85/85, 5.5 VOLTS	959 HRS	77	0	
BIASED MOISTURE	9809	85/85, 5.5 VOLTS	959 HRS	77	0	
BIASED MOISTURE	9809	85/85, 5.5 VOLTS	959 HRS	77	0	
BIASED MOISTURE	9809	85/85, 5.5 VOLTS	959 HRS	77	0	
HAST	0328	130C, 85%R.H.,5.5V	96 HRS	77	0	
					Total:	0

UNBIASED MOISTURE RESISTANCE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
AUTOCLAVE	9519	121C, 2 ATM STEAM, UNBIASED	96 HRS	38	0
AUTOCLAVE	9520	121C, 2 ATM STEAM, UNBIASED	96 HRS	38	0
AUTOCLAVE	9613	121C, 2 ATM STEAM, UNBIASED	96 HRS	38	0
AUTOCLAVE	9613	121C, 2 ATM STEAM, UNBIASED	96 HRS	38	0
AUTOCLAVE	9639	121C, 2 ATM STEAM, UNBIASED	96 HRS	38	0
AUTOCLAVE	9652	121C, 2 ATM STEAM, UNBIASED	168 HRS	43	0
AUTOCLAVE	9702	121C, 2 ATM STEAM, UNBIASED	96 HRS	38	0
AUTOCLAVE	9719	121C, 2 ATM STEAM, UNBIASED	96 HRS	38	0

AUTOCLAVE	9719	121C, 2 ATM STEAM, UNBIASED	96	HRS	38	0
AUTOCLAVE	9724	121C, 2 ATM STEAM, UNBIASED	168	HRS	45	0
AUTOCLAVE	9732	121C, 2 ATM STEAM, UNBIASED	168	HRS	45	0
AUTOCLAVE	9742	121C, 2 ATM STEAM, UNBIASED	96	HRS	39	0
AUTOCLAVE	9809	121C, 2 ATM STEAM, UNBIASED	96	HRS	40	0
AUTOCLAVE	9809	121C, 2 ATM STEAM, UNBIASED	96	HRS	40	0
AUTOCLAVE	9809	121C, 2 ATM STEAM, UNBIASED	96	HRS	40	0
AUTOCLAVE	0328	121C, 2 ATM STEAM, UNBIASED	168	HRS	77	0
				Total:		0

FAILURE RATE:

MTTF (YRS): 231951

FITS: 0.5