

RELIABILITY REPORT
FOR

DS1267, Rev A2

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:

DS1267, Rev A2

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 the device used in this qualification 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/assembly is:

FAILURE RATE: **MTTF (YRS): 38651** **FITS: 3.0**

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. This is a description of the device either used as a reliability test vehicle for a process / assembly qualification / monitor or a device used as part of a product qualification / monitor. Following this is the assembly information. This section includes a description of the assembly vehicle used to generate this reliability data for both qualifications and monitors. The next section is the detailed reliability data for each stress found in the qualification / monitor. If there are additional processes or assemblies used as part of this report, a description of each will follow which includes the respective reliability data for that process/assembly. The reliability data section includes the latest data available. Some of this data may be generic with other products.

Device Information:

Device: DS1267
 Process: 1P, 1M, 1.2um, II Poly1, TEOS Spacer,
 Passivation: Passivation w/Nov TEOS Oxide-Nitride
 Die Size: 85 x 137
 Number of Transistors: 6000
 Interconnect: Aluminum / 1% Silicon / 0.5% Copper
 Gate Oxide Thickness: 225 Å

Assembly Information:

Qualification Vehicle: DS1267
 Assembly Site: Carsem
 Pin Count: 16
 Package Type: SOIC
 Body Size: 300x2.3
 Mold Compound: Sumitomo 6300H
 Lead Frame: Stamped Copper CDA194
 Lead Finsh: SnPb Plate
 Die Attach: 84-1 LMISR4 Epoxy Silverfilled Ablebond
 Bond Wire / Size: Au / 1.0 mil
 Flammability: UL 94-V0
 Moisture Sensitivity (JEDEC J-STD20A) Level 1
 Date Code Range: 0037 to 0037

MOISTURE SENSITIVITY LEVEL 1

DESCRIPTION	DATE CD	CONDITION	READPOINT	QTY	FAILS	FA#
EXTERNAL VISUAL	0037	MIL-STD-883-2009	1 DYS	8	0	
ULTRASOUND		J-STD-020	1 DYS	8	0	
STORAGE LIFE		125C	24 HRS	8	0	
MOISTURE SOAK		85 C/85% R.H.	168 HRS	8	0	
CONVECTION REFLOW		235C +5/-0C	3 PASS	8	1	No FA

PRECONDITION U/S	0037	J-STD-020	1	DYS	8	1	No FA
						Total:	2

OPERATING LIFE

DESCRIPTION	DATE CD	CONDITION	READPOINT	QTY	FAILS	FA#	
HIGH VOLTAGE LIFE	0037	125C, 6.0 V, -4.0V	1000 HRS	116	1	30000884	
						Total:	1

PACKAGE TESTS

DESCRIPTION	DATE CD	CONDITION	READPOINT	QTY	FAILS	FA#	
SOLDERABILITY	0037	MIL-STD-883-2003	2 DYS	3	0		
X-RAY	0037	MIL-STD-883-2012 : TOP & SIDE VIEW	2 DYS	6	0		
PHYSICAL DIMENSIONS		MIL-STD-883-2016	2 DYS	6	0		
MARK PERMANENCY		MIL-STD-883-2015	2 DYS	6	0		
LEAD INTEGRITY		MIL-STD-883-2004 : COND B2	2 DYS	6	0		
						Total:	0

PRECONDITIONING LEVEL 1

DESCRIPTION	DATE CD	CONDITION	READPOINT	QTY	FAILS	FA#	
STORAGE LIFE	0037	125C	24 HRS	315	0		
MOISTURE SOAK		85 C/85% R.H.	168 HRS	315	0		
CONVECTION REFLOW		235C +5/-0C	3 PASS	315	0		
						Total:	0

TEMPERATURE CYCLE

DESCRIPTION	DATE CD	CONDITION	READPOINT	QTY	FAILS	FA#	
TEMP CYCLE	0037	-55C TO 125C	1000 CYS	74	0		
						Total:	0

TEMPERATURE HUMIDITY BIAS

DESCRIPTION	DATE CD	CONDITION	READPOINT	QTY	FAILS	FA#	
BIASED MOISTURE	0037	85/85, 5.5 VOLTS	959 HRS	77	0		
						Total:	0

UNBIASED MOISTURE RESISTANCE

DESCRIPTION	DATE CD	CONDITION	READPOINT	QTY	FAILS	FA#	
AUTOCLAVE	0037	121C, 2 ATM STEAM, UNBIASED	168 HRS	44	0		
						Total:	0

Assembly Information:

Qualification Vehicle: DS1267
Assembly Site: ATP (Amkor, PI)
Pin Count: 20
Package Type: TSSOP
Body Size: 4.4x0.9
Mold Compound: Sumitomo 7351T
Lead Frame: Stamped Copper C7025
Lead Finish: SnPb Plate
Die Attach: 84-1 LMISR4 Epoxy Silverfilled Ablebond
Bond Wire / Size: Au / 1.0 mil
Flammability: UL 94-V0
Moisture Sensitivity (JEDEC J-STD20A) Level 1
Date Code Range: 0021 to 0408

OPERATING LIFE

DESCRIPTION	DATE CD	CONDITION	READPOINT	QTY	FAILS	FA#
INFANT LIFE	0021	125C, 6.0 V, -4.0V	48 HRS	224	0	
HIGH VOLTAGE LIFE	0021	125C, 6.0 V, -4.0V	1000 HRS	77	0	
HIGH VOLTAGE LIFE	0104	125C, 6.0 V, -4.0V	1000 HRS	75	0	
HIGH TEMP OP LIFE	0309	125C, 5.5 V, -4.0V	1000 HRS	80	0	
HIGH VOLTAGE LIFE	0340	125C, 6.0 V, -4.0V	1000 HRS	80	0	
HIGH VOLTAGE LIFE	0357	125C, 5.5 V, -4.0V	1000 HRS	80	0	
HIGH VOLTAGE LIFE	0408	125C, 5.5 V, -4.0V	500 HRS	80		
				Total:	0	

PRECONDITIONING LEVEL 1

DESCRIPTION	DATE CD	CONDITION	READPOINT	QTY	FAILS	FA#
ULTRASOUND	0021	J-STD-020	5 DYS	4	0	
STORAGE LIFE	0021	125C	24 HRS	238	0	
MOISTURE SOAK		85 C/85% R.H.	168 HRS	238	0	
CONVECTION REFLOW		235C +5/-0C	3 PASS	238	0	
PRECONDITION U/S	0021	J-STD-020	2 DYS	4	0	
ULTRASOUND	0104	J-STD-020	5 DYS	4	0	
STORAGE LIFE	0104	125C	24 HRS	238	0	
MOISTURE SOAK		85 C/85% R.H.	168 HRS	238	0	
CONVECTION REFLOW		235C +5/-0C	3 PASS	238	0	
PRECONDITION U/S	0104	J-STD-020	2 DYS	4		
ULTRASOUND	0309	J-STD-020	5 DYS	4	0	
STORAGE LIFE	0309	125C	24 HRS	241	0	
MOISTURE SOAK		85 C/85% R.H.	168 HRS	241	0	
CONVECTION REFLOW		235C +5/-0C	3 PASS	241	0	
PRECONDITION U/S	0309	J-STD-020	2 DYS	4	0	
ULTRASOUND	0340	J-STD-020	5 DYS	4	0	
STORAGE LIFE	0340	125C	24 HRS	241	0	

MOISTURE SOAK	0340	85 C/85% R.H.	168	HRS	241	0
CONVECTION REFLOW		235C +5/-0C	3	PASS	241	0
PRECONDITION U/S	0340	J-STD-020	2	DYS	4	0
ULTRASOUND	0357	J-STD-020	5	DYS	4	0
STORAGE LIFE	0357	125C	24	HRS	241	0
MOISTURE SOAK		85 C/85% R.H.	168	HRS	241	0
CONVECTION REFLOW		235C +5/-0C	3	PASS	241	0
PRECONDITION U/S	0357	J-STD-020	2	DYS	4	0
ULTRASOUND	0408	J-STD-020	5	DYS	4	0
STORAGE LIFE	0408	125C	24	HRS	241	0
MOISTURE SOAK		85 C/85% R.H.	168	HRS	241	0
CONVECTION REFLOW		235C +5/-0C	3	PASS	241	0
PRECONDITION U/S	0408	J-STD-020	2	DYS	4	0
					Total:	0

TEMPERATURE CYCLE

DESCRIPTION	DATE CD	CONDITION	READPOINT	QTY	FAILS	FA#
TEMP CYCLE	0021	-55C TO 125C	1000 CYS	35	0	
TEMP CYCLE	0104	-55C TO 125C	1000 CYS	35	0	
TEMP CYCLE	0309	-55C TO 125C	1000 CYS	40	0	
TEMP CYCLE	0340	-55C TO 125C	1000 CYS	40	0	
TEMP CYCLE	0357	-55C TO 125C	1000 CYS	40	0	
TEMP CYCLE	0408	-55C TO 125C	1000 CYS	40	0	
				Total:	0	

TEMPERATURE HUMIDITY BIAS

DESCRIPTION	DATE CD	CONDITION	READPOINT	QTY	FAILS	FA#
BIASED MOISTURE	0021	85/85, 5.5 VOLTS	959 HRS	75	0	
BIASED MOISTURE	0104	85/85, 5.5 VOLTS	959 HRS	75	0	
BIASED MOISTURE	0309	85/85, 5.5 VOLTS	1000 HRS	77	0	
BIASED MOISTURE	0340	85/85, 5.5 VOLTS	1000 HRS	77	0	
BIASED MOISTURE	0357	85/85, 5.5 VOLTS	1000 HRS	77	0	
BIASED MOISTURE	0408	85/85, 5.5 VOLTS	500 HRS	77		
				Total:	0	

UNBIASED MOISTURE RESISTANCE

DESCRIPTION	DATE CD	CONDITION	READPOINT	QTY	FAILS	FA#
AUTOCLAVE	0021	121C, 2 ATM STEAM, UNBIASED	96 HRS	35	0	
AUTOCLAVE	0104	121C, 2 ATM STEAM, UNBIASED	96 HRS	34	0	
AUTOCLAVE	0309	121C, 2 ATM STEAM, UNBIASED	168 HRS	40	0	
AUTOCLAVE	0340	121C, 2 ATM STEAM, UNBIASED	168 HRS	40	0	
AUTOCLAVE	0357	121C, 2 ATM STEAM, UNBIASED	96 HRS	40	0	
AUTOCLAVE	0408	121C, 2 ATM STEAM, UNBIASED	168 HRS	40	0	

Total: 0

Assembly Information:

Qualification Vehicle: DS1267
Assembly Site: Carsem
Pin Count: 20
Package Type: TSSOP
Body Size: 4.4x0.9
Mold Compound: Sumitomo 7351LS
Lead Frame: Stamped Copper C7025
Lead Finish: SnPb Plate
Die Attach: 84-1 LMISR4 Epoxy Silverfilled Ablebond
Bond Wire / Size: Au / 1.0 mil
Flammability: UL 94-V0
Moisture Sensitivity (JEDEC J-STD20A) Level 1
Date Code Range: 0102 to 0237

OPERATING LIFE

DESCRIPTION	DATE CD	CONDITION	READPOINT	QTY	FAILS	FA#
INFANT LIFE	0102	125C, 6.0 V, -4.0V	48 HRS	234	0	
HIGH VOLTAGE LIFE	0102	125C, 6.0 V, -4.0V	1000 HRS	77	0	
HIGH VOLTAGE LIFE	0237	125C, 6.0 V, -4.0V	1000 HRS	79	0	
				Total:	0	

PRECONDITIONING LEVEL 1

DESCRIPTION	DATE CD	CONDITION	READPOINT	QTY	FAILS	FA#
ULTRASOUND	0102	J-STD-020	5 DYS	4	0	
STORAGE LIFE	0102	125C	24 HRS	238	0	
MOISTURE SOAK		85 C/85% R.H.	168 HRS	238	0	
CONVECTION REFLOW		235C +5/-0C	3 PASS	238	0	
PRECONDITION U/S	0102	J-STD-020	2 DYS	4	0	
ULTRASOUND	0237	J-STD-020	5 DYS	4	0	
STORAGE LIFE	0237	125C	24 HRS	241	0	
MOISTURE SOAK		85 C/85% R.H.	168 HRS	241	0	
CONVECTION REFLOW		235C +5/-0C	3 PASS	241	0	
PRECONDITION U/S	0237	J-STD-020	2 DYS	4	0	
				Total:	0	

TEMPERATURE CYCLE

DESCRIPTION	DATE CD	CONDITION	READPOINT	QTY	FAILS	FA#
TEMP CYCLE	0102	-55C TO 125C	1000 CYS	40	0	
TEMP CYCLE	0237	-55C TO 125C	1000 CYS	40	0	
				Total:	0	

TEMPERATURE HUMIDITY BIAS

DESCRIPTION	DATE CD	CONDITION	READPOINT	QTY	FAILS	FA#
BIASED MOISTURE	0102	85/85, 5.5 VOLTS	959 HRS	77	0	
BIASED MOISTURE	0237	85/85, 5.5 VOLTS	1000 HRS	77	0	

Total: 0

UNBIASED MOISTURE RESISTANCE

DESCRIPTION	DATE CD	CONDITION	READPOINT	QTY	FAILS	FA#
AUTOCLAVE	0102	121C, 2 ATM STEAM, UNBIASED	96 HRS	40	0	
AUTOCLAVE	0237	121C, 2 ATM STEAM, UNBIASED	96 HRS	40	5	30014721
					Total:	5

FAILURE RATE: MTTF (YRS): 38651 FITS: 3.0