

RELIABILITY REPORT  
FOR

**DS1232L, Rev C2**

**Dallas Semiconductor**

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Prepared by:

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**Conclusion:**

The following Reliability Test successfully meets the quality and reliability standards set forth by this special Temperature Cycle Evaluation:

DS1232L, Rev C2

**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](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<sup>-5</sup> 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): 65332**                      **FITS: 1.7**

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 for this report. 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 assemblies used as part of this report, a description of each will follow which includes the respective reliability data for that assembly. The reliability data section includes the latest data available.

**Device Information:**

Device: DS1232  
 Process: 1P, 1M, 0.8um, PdpDiode, Low Vts , N+ESDII, WJ BPSG  
 Passivation: Passivation w/Nov TEOS Oxide-Nitride  
 Die Size: 78 x 50  
 Number of Transistors: 1150  
 Interconnect: Aluminum / 1% Silicon / 0.5% Copper  
 Gate Oxide Thickness: 175 Å

**Assembly Information:**

Qualification Vehicle: DS1232  
 Assembly Site: ATP (Amkor, PI)  
 Pin Count: 8  
 Package Type: SOIC  
 Body Size: 150x1.4  
 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  
 Theta JA: 170  
 Theta JC: 40  
 Flammability: UL 94-V0  
 Moisture Sensitivity (JEDEC J-STD20A) Level 1  
 Date Code Range: 0252 to 0327

**OPERATING LIFE**

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QTY	FAILS	FA#
HIGH VOLTAGE LIFE	0252	125C, 7.0 VOLTS	1000 HRS	80	0	
HIGH TEMP OP LIFE	0327	125C, 5.5 VOLTS	1000 HRS	80	0	
<b>Total:</b>					<b>0</b>	

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**PRECONDITIONING LEVEL 1**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
ULTRASOUND	0252		J-STD-020	1 DYS	4	0	
STORAGE LIFE	0252		125C	24 HRS	241		
MOISTURE SOAK			85 C/85% R.H.	168 HRS	241		
CONVECTION REFLOW			235C +5/-0C	3 PASS	241	0	
PRECONDITION U/S	0252		J-STD-020	7 DYS	4	0	
ULTRASOUND	0327		J-STD-020	1 DYS	4	0	
STORAGE LIFE	0327		125C	24 HRS	241		
MOISTURE SOAK			85 C/85% R.H.	168 HRS	241		
CONVECTION REFLOW			235C +5/-0C	3 PASS	241	0	
PRECONDITION U/S	0327		J-STD-020	7 DYS	4	0	
				<b>Total:</b>		<b>0</b>	

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**TEMPERATURE CYCLE**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
TEMP CYCLE	0252		-55C TO 125C	1000 CYS	40	0	
TEMP CYCLE	0327		-55C TO 125C	1000 CYS	40	0	
				<b>Total:</b>		<b>0</b>	

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**TEMPERATURE HUMIDITY BIAS**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
HAST	0252		130C, 85%R.H.,5.5V	96 HRS	77	0	
HAST	0327		130C, 85%R.H.,5.5V	96 HRS	77	0	
				<b>Total:</b>		<b>0</b>	

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**UNBIASED MOISTURE RESISTANCE**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
AUTOCLAVE	0252		121C, 2 ATM STEAM, UNBIASED	168 HRS	40	0	
AUTOCLAVE	0327		121C, 2 ATM STEAM, UNBIASED	168 HRS	40	0	
				<b>Total:</b>		<b>0</b>	

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**Assembly Information:**

Qualification Vehicle: DS1232  
Assembly Site: Carsem  
Pin Count: 8  
Package Type: SOIC  
Body Size: 150x1.4  
Mold Compound: Sumitomo 6300H  
Lead Frame: Stamped Copper CDA194  
Lead Finish: SnPb Plate  
Die Attach: 84-1 LMISR4 Epoxy Silverfilled Ablebond  
Bond Wire / Size: Au / 1.0 mil  
Theta JA: 170  
Theta JC: 40  
Flammability: UL 94-V0  
Moisture Sensitivity (JEDEC J-STD20A) Level 1  
Date Code Range: 0310 to 0310

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**OPERATING LIFE**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
HIGH TEMP OP LIFE	0310		125C, 5.5 VOLTS	1000 HRS	80	0	
<b>Total:</b>						<b>0</b>	

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**PRECONDITIONING LEVEL 1**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
ULTRASOUND	0310		J-STD-020	1 DYS	4	0	
STORAGE LIFE	0310		125C	24 HRS	241		
MOISTURE SOAK			85 C/85% R.H.	168 HRS	241		
CONVECTION REFLOW			235C +/-0C	3 PASS	241	0	
PRECONDITION U/S	0310		J-STD-020	7 DYS	4	0	
<b>Total:</b>						<b>0</b>	

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**TEMPERATURE CYCLE**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
TEMP CYCLE	0310		-55C TO 125C	1000 CYS	40	0	
<b>Total:</b>						<b>0</b>	

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**TEMPERATURE HUMIDITY BIAS**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
HAST	0310		130C, 85%R.H.,5.5V	96 HRS	77	0	
<b>Total:</b>						<b>0</b>	

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**UNBIASED MOISTURE RESISTANCE**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
AUTOCLAVE	0310		121C, 2 ATM STEAM, UNBIASED	168 HRS	40	0	
<b>Total:</b>						<b>0</b>	

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**Assembly Information:**

Qualification Vehicle: DS1232  
Assembly Site: NSEB  
Pin Count: 8  
Package Type: SOIC  
Body Size: 150x1.4  
Mold Compound: Sumitomo 6600CS  
Lead Frame: Stamped Copper CDA194  
Lead Finish: SnPb Plate  
Die Attach: 84-1 LMISR4 Epoxy Silverfilled Ablebond  
Bond Wire / Size: Au / 1.0 mil  
Theta JA: 170  
Theta JC: 40  
Flammability: UL 94-V0  
Moisture Sensitivity (JEDEC J-STD20A) Level 1  
Date Code Range: 0403 to 0406

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**OPERATING LIFE**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
HIGH TEMP OP LIFE	0403		125C, 5.5 VOLTS	1000 HRS	80	0	
HIGH TEMP OP LIFE	0406		125C, 5.5 VOLTS	1000 HRS	80	0	
<b>Total:</b>						<b>0</b>	

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**PRECONDITIONING LEVEL 1**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
ULTRASOUND	0403		J-STD-020	1 DYS	4	0	
STORAGE LIFE	0403		125C	24 HRS	241		
MOISTURE SOAK			85 C/85% R.H.	168 HRS	241		
CONVECTION REFLOW			235C +5/-0C	3 PASS	241	0	
PRECONDITION U/S	0403		J-STD-020	7 DYS	4	0	
ULTRASOUND	0406		J-STD-020	1 DYS	4	0	
STORAGE LIFE	0406		125C	24 HRS	241		
MOISTURE SOAK			85 C/85% R.H.	168 HRS	241		
CONVECTION REFLOW			235C +5/-0C	3 PASS	241	0	
PRECONDITION U/S	0406		J-STD-020	7 DYS	4	0	
<b>Total:</b>						<b>0</b>	

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**TEMPERATURE CYCLE**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
TEMP CYCLE	0403		-55C TO 125C	1000 CYS	40	0	
TEMP CYCLE	0406		-55C TO 125C	1000 CYS	40	0	
<b>Total:</b>						<b>0</b>	

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**TEMPERATURE HUMIDITY BIAS**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
HAST	0403		130C, 85%R.H.,5.5V	96 HRS	77	1	30031601
HAST	0406		130C, 85%R.H.,5.5V	96 HRS	77	0	

Total: 1

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**UNBIASED MOISTURE RESISTANCE**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
AUTOCLAVE	0403		121C, 2 ATM STEAM, UNBIASED	96 HRS	40	0	
AUTOCLAVE	0406		121C, 2 ATM STEAM, UNBIASED	96 HRS	40	0	
						<b>Total:</b>	<b>0</b>

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**Assembly Information:**

Qualification Vehicle: DS1232  
Assembly Site: OSEP  
Pin Count: 8  
Package Type: SOIC  
Body Size: 150x1.4  
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  
Theta JA: 170  
Theta JC: 40  
Flammability: UL 94-V0  
Moisture Sensitivity (JEDEC J-STD20A) Level 1  
Date Code Range: 0105 to 0437

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**ELECTRICAL CHARACTERIZATION**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
ESD SENSITIVITY	0429		EOS/ESD S5.1 HBM 500 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0429		EOS/ESD S5.1 HBM 1000 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0429		EOS/ESD S5.1 HBM 2000 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0429		EOS/ESD S5.1 HBM 4000 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0429		EOS/ESD S5.1 HBM 8000 VOLTS	1 PUL'S	3	3	No FA
LATCH-UP	0429		JESD78, I-TEST 125C	2 DYS	6	0	
LATCH-UP	0429		JESD78, Vsupply TEST 125C	2 DYS	6	0	
						<b>Total:</b>	<b>3</b>

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**OPERATING LIFE**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
HIGH VOLTAGE LIFE	0111		125C, 7.0 VOLTS	1000 HRS	79	0	
HIGH TEMP OP LIFE	0429		125C, 5.5 VOLTS	1000 HRS	77	0	
						<b>Total:</b>	<b>0</b>

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**PRECONDITIONING LEVEL 1**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
ULTRASOUND	0105		J-STD-020	1 DYS	4	0	
ULTRASOUND	0111		J-STD-020	1 DYS	4	0	
STORAGE LIFE	0111		125C	24 HRS	241		

MOISTURE SOAK	0111	85 C/85% R.H.	168	HRS	241	
CONVECTION REFLOW		235C +5/-0C	3	PASS	241	0
PRECONDITION U/S	0111	J-STD-020	7	DYS	4	0
ULTRASOUND	0437	J-STD-020	1	DYS	241	0
STORAGE LIFE	0437	125C	24	HRS	241	
MOISTURE SOAK		85 C/85% R.H.	168	HRS	241	
CONVECTION REFLOW		235C +5/-0C	3	PASS	241	
<b>Total:</b>						<b>0</b>

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#### TEMPERATURE CYCLE

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
TEMP CYCLE	0111		-55C TO 125C	1000	CYS	40	0
TEMP CYCLE	0429		-55C TO 125C	1000	CYS	77	0
<b>Total:</b>						<b>0</b>	

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#### TEMPERATURE HUMIDITY BIAS

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
HAST	0111		130C, 85%R.H.,5.5V	96	HRS	77	0
HAST	0429		130C, 85%R.H.,5.5V	96	HRS	77	0
<b>Total:</b>						<b>0</b>	

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#### UNBIASED MOISTURE RESISTANCE

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
AUTOCLAVE	0111		121C, 2 ATM STEAM, UNBIASED	168	HRS	40	0
AUTOCLAVE	0429		121C, 2 ATM STEAM, UNBIASED	168	HRS	77	0
<b>Total:</b>						<b>0</b>	

**FAILURE RATE:**                      **MTTF (YRS): 65332**                      **FITS: 1.7**