

RELIABILITY REPORT
FOR

DS1621, Rev B4

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:

DS1621, Rev B4

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): 60577** **FITS: 1.9**

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: DS1621
 Process: D6W-2P2M,HPVt,E2,TCN1 PBL:GOI
 Passivation: Passivation w/Nov TEOS Oxide-Nitride
 Die Size: 71 x 54
 Number of Transistors: 9279
 Interconnect: Aluminum / 1% Silicon / 0.5% Copper
 Gate Oxide Thickness: 150 Å

Assembly Information:

Qualification Vehicle: DS1621
 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 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: 0345 to 0345

OPERATING LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
HIGH TEMP OP LIFE	0345	125C, 5.5 VOLTS	1000 HRS	77	0
			Total:		0

PRECONDITIONING LEVEL 1

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
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ULTRASOUND	0345	J-STD-020	7	DYS	4	0
STORAGE LIFE	0345	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	0345	J-STD-020	7	DYS	4	0
					Total:	0

STORAGE LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS	
STORAGE LIFE	0345	150C	1000 HRS	43	0	
					Total:	0

TEMPERATURE CYCLE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS	
TEMP CYCLE	0345	-55C TO 125C	1000 CYS	40	0	
					Total:	0

TEMPERATURE HUMIDITY BIAS

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS	
BIASED MOISTURE	0345	85/85, 5.5 VOLTS	1000 HRS	70	0	
					Total:	0

WRITE CYCLE STRESS

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS	
WRITE CYCLE STRESS	0345	85 C, 5.5 VOLTS	50 KCYS	50	0	
					Total:	0

Device Information:

Device: DS1621
 Process: D8W-1P1M,HPVt,E2 LOCOS:GOI
 Passivation: Passivation w/Nov TEOS Oxide-Nitride
 Die Size: 76 x 116
 Number of Transistors: 21000
 Interconnect: Aluminum / 1% Silicon / 0.5% Copper
 Gate Oxide Thickness: 175 Å

Assembly Information:

Qualification Vehicle: DS1621
 Assembly Site: ATK (Amkor, K)
 Pin Count: 8
 Package Type: SOIC
 Body Size: 150x1.4
 Mold Compound: Shinetsu 184
 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: 9807 to 9807

OPERATING LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
INFANT LIFE	9807	125C, 7.0 VOLTS	48 HRS	236	0
HIGH VOLTAGE LIFE	9807	125C, 7.0 VOLTS	1000 HRS	77	0
				Total:	0

PRECONDITIONING LEVEL 1

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
ULTRASOUND	9807	J-STD-020	2 DYS	4	0
STORAGE LIFE	9807	125C	24 HRS	241	
MOISTURE SOAK		85 C/85% R.H.	168 HRS	241	
SOLDER HEAT		HTC VAPOR PHASE	3 PASS	240	0
PRECONDITION U/S	9807	J-STD-020	1 DYS	4	0
				Total:	0

STORAGE LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
STORAGE LIFE	9807	150C	1000 HRS	45	0
				Total:	0

TEMPERATURE CYCLE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
TEMP CYCLE	9807	-55C TO 125C	1000 CYS	39	0
				Total:	0

TEMPERATURE HUMIDITY BIAS

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
BIASED MOISTURE	9807	85/85, 5.5 VOLTS	959 HRS	70	0
				Total:	0

Assembly Information:

Qualification Vehicle: DS1621
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
Flammability: UL 94-V0
Moisture Sensitivity Level 1
(JEDEC J-STD20A)
Date Code Range: 9915 to 0247

ELECTRICAL CHARACTERIZATION

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
ESD SENSITIVITY	0024	EOS/ESD S5.1 HBM 1000 VOLTS	1 PUL'S	3	0
ESD SENSITIVITY	0024	EOS/ESD S5.1 HBM 1500 VOLTS	1 PUL'S	3	2

ESD SENSITIVITY	0024	EOS/ESD S5.1 HBM 2000 VOLTS	1	PUL'S	3	3
ESD SENSITIVITY	0216	EOS/ESD S5.1 HBM 500 VOLTS	1	PUL'S	3	0
ESD SENSITIVITY	0216	EOS/ESD S5.1 HBM 1000 VOLTS	1	PUL'S	3	0
ESD SENSITIVITY	0216	EOS/ESD S5.1 HBM 2000 VOLTS	1	PUL'S	3	2
ESD SENSITIVITY	0216	EOS/ESD S5.1 HBM 4000 VOLTS	1	PUL'S	3	3
ESD SENSITIVITY	0216	EOS/ESD S5.1 HBM 8000 VOLTS	1	PUL'S	3	3
LATCH-UP	0216	JESD78, I-TEST 125C	2	DYS	3	3
LATCH-UP	0216	JESD78, Vsupply TEST 125C	2	DYS	3	0
LATCH-UP	0216	JESD78, I-TEST 70C	2	DYS	3	0
					Total:	16

OPERATING LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS	
HIGH VOLTAGE LIFE	0216	125C, 7.0 VOLTS	1000 HRS	80	0	
HIGH VOLTAGE LIFE	0216	125C, 7.0 VOLTS	1000 HRS	80	0	
HIGH VOLTAGE LIFE	0216	125C, 7.0 VOLTS	1000 HRS	80	0	
HIGH VOLTAGE LIFE	0232	125C, 7.0 VOLTS	1000 HRS	77	0	
HIGH TEMP OP LIFE	0247	125C, 5.5 VOLTS	1000 HRS	77	0	
INFANT LIFE	9915	125C, 7.0 VOLTS	48 HRS	237	0	
HIGH VOLTAGE LIFE	9915	125C, 7.0 VOLTS	1000 HRS	77	0	
					Total:	0

PRECONDITIONING LEVEL 1

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS	
ULTRASOUND	0232	J-STD-020	7 DYS	4	0	
STORAGE LIFE	0232	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	0232	J-STD-020	7 DYS	4	0	
ULTRASOUND	0247	J-STD-020	7 DYS	4	0	
STORAGE LIFE	0247	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	0247	J-STD-020	7 DYS	4	0	
ULTRASOUND	9915	J-STD-020	7 DYS	4	0	
STORAGE LIFE	9915	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	9915	J-STD-020	7 DYS	4	0	
					Total:	0

STORAGE LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
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STORAGE LIFE	0232	150C	1000 HRS	50	0
STORAGE LIFE	0247	150C	1000 HRS	50	0
STORAGE LIFE	9915	150C	1000 HRS	45	0
Total:				0	0

TEMPERATURE CYCLE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
TEMP CYCLE	0232	-55C TO 125C	1000 CYS	40	0
TEMP CYCLE	0247	-55C TO 125C	1000 CYS	40	0
TEMP CYCLE	9915	-55C TO 125C	1000 CYS	40	0
Total:				0	0

TEMPERATURE HUMIDITY BIAS

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
BIASED MOISTURE	0232	85/85, 5.5 VOLTS	1000 HRS	70	0
BIASED MOISTURE	0247	85/85, 5.5 VOLTS	1000 HRS	70	0
BIASED MOISTURE	9915	85/85, 5.5 VOLTS	959 HRS	70	0
Total:				0	0

W/E ENDURANCE AND DATA RET'N

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
WRITE CYCLE STRESS	0216	85 C, 7.0 VOLTS	50 KCYS	80	0
STORAGE LIFE		150C	1000 HRS	79	0
WRITE CYCLE STRESS	0216	85 C, 7.0 VOLTS	50 KCYS	80	0
STORAGE LIFE		150C	1000 HRS	80	0
WRITE CYCLE STRESS	0216	85 C, 7.0 VOLTS	50 KCYS	80	0
STORAGE LIFE		150C	1000 HRS	80	0
Total:				0	0

WRITE CYCLE STRESS

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
WRITE CYCLE STRESS	0232	85 C, 7.0 VOLTS	50 KCYS	50	0
WRITE CYCLE STRESS	0247	85 C, 5.5 VOLTS	50 KCYS	50	0
WRITE CYCLE STRESS	9915	85 C, 7.0 VOLTS	50 KCYS	47	0
Total:				0	0

Assembly Information:

Qualification Vehicle: DS1621
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
Flammability: UL 94-V0
Moisture Sensitivity (JEDEC J-STD20A) Level 1
Date Code Range: 9740 to 9749

OPERATING LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
INFANT LIFE	9740	125C, 7.0 VOLTS	48 HRS	236	0
HIGH VOLTAGE LIFE	9740	125C, 7.0 VOLTS	1000 HRS	77	0
INFANT LIFE	9745	125C, 7.0 VOLTS	48 HRS	237	0
HIGH VOLTAGE LIFE	9745	125C, 7.0 VOLTS	1000 HRS	71	0
INFANT LIFE	9749	125C, 7.0 VOLTS	48 HRS	230	0
HIGH VOLTAGE LIFE	9749	125C, 7.0 VOLTS	1000 HRS	68	0
Total:					0

PRECONDITIONING LEVEL 1

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
ULTRASOUND	9740	J-STD-020	1 DYS	4	0
STORAGE LIFE	9740	125C	24 HRS	241	
MOISTURE SOAK		85 C/85% R.H.	168 HRS	241	
SOLDER HEAT		HTC VAPOR PHASE	3 PASS	241	0
PRECONDITION U/S	9740	J-STD-020	1 DYS	4	0
ULTRASOUND	9745	J-STD-020	1 DYS	4	0
STORAGE LIFE	9745	125C	24 HRS	241	
MOISTURE SOAK		85 C/85% R.H.	168 HRS	241	
SOLDER HEAT		HTC VAPOR PHASE	3 PASS	241	0
PRECONDITION U/S	9745	J-STD-020	1 DYS	4	0
ULTRASOUND	9749	J-STD-020	1 DYS	4	0
STORAGE LIFE	9749	125C	24 HRS	241	
MOISTURE SOAK		85 C/85% R.H.	168 HRS	241	
SOLDER HEAT		HTC VAPOR PHASE	3 PASS	241	0
PRECONDITION U/S	9749	J-STD-020	2 DYS	4	0
Total:					0

STORAGE LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
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STORAGE LIFE	9740	150C	1000 HRS	50	0
STORAGE LIFE	9745	150C	1000 HRS	43	0
STORAGE LIFE	9749	150C	1000 HRS	50	0
				Total:	0

TEMPERATURE CYCLE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
TEMP CYCLE	9740	-55C TO 125C	1000 CYS	40	0
TEMP CYCLE	9745	-55C TO 125C	1000 CYS	40	0
TEMP CYCLE	9749	-55C TO 125C	1000 CYS	40	0
				Total:	0

TEMPERATURE HUMIDITY BIAS

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
BIASED MOISTURE	9740	85/85, 5.5 VOLTS	959 HRS	65	0
BIASED MOISTURE	9745	85/85, 5.5 VOLTS	959 HRS	70	0
BIASED MOISTURE	9749	85/85, 5.5 VOLTS	959 HRS	68	0
				Total:	0

Assembly Information:

Qualification Vehicle: DS1621
 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
 Flammability: UL 94-V0
 Moisture Sensitivity (JEDEC J-STD20A) Level 1
 Date Code Range: 9950 to 0326

OPERATING LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
HIGH VOLTAGE LIFE	0237	125C, 7.0 VOLTS	1000 HRS	75	0
HIGH TEMP OP LIFE	0326	125C, 5.5 VOLTS	1000 HRS	77	1
INFANT LIFE	9950	125C, 7.0 VOLTS	48 HRS	237	0
HIGH VOLTAGE LIFE	9950	125C, 7.0 VOLTS	1000 HRS	77	0
				Total:	1

PRECONDITIONING LEVEL 1

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
ULTRASOUND	0237	J-STD-020	7 DYS	4	0
STORAGE LIFE	0237	125C	24 HRS	240	
MOISTURE SOAK		85 C/85% R.H.	168 HRS	240	
CONVECTION REFLOW		235C +5/-0C	3 PASS	240	0

PRECONDITION U/S	0237	J-STD-020	7	DYS	4	0
ULTRASOUND	0326	J-STD-020	7	DYS	4	0
STORAGE LIFE	0326	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	0326	J-STD-020	7	DYS	4	0
ULTRASOUND	9950	J-STD-020	7	DYS	4	0
STORAGE LIFE	9950	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	9950	J-STD-020	7	DYS	4	0
					Total:	0

STORAGE LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS	
STORAGE LIFE	0237	150C	1000 HRS	50	0	
STORAGE LIFE	0326	150C	1000 HRS	50	0	
STORAGE LIFE	9950	150C	1000 HRS	50	0	
					Total:	0

TEMPERATURE CYCLE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS	
TEMP CYCLE	0237	-55C TO 125C	1000 CYS	40	0	
TEMP CYCLE	0326	-55C TO 125C	1000 CYS	40	1	
TEMP CYCLE	9950	-55C TO 125C	1000 CYS	40	0	
					Total:	1

TEMPERATURE HUMIDITY BIAS

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS	
BIASED MOISTURE	0237	85/85, 5.5 VOLTS	1000 HRS	70	0	
BIASED MOISTURE	0326	85/85, 5.5 VOLTS	1000 HRS	70	0	
BIASED MOISTURE	9950	85/85, 5.5 VOLTS	959 HRS	70	0	
					Total:	0

WRITE CYCLE STRESS

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS	
WRITE CYCLE STRESS	0237	85 C, 7.0 VOLTS	50 KCYS	50	0	
WRITE CYCLE STRESS	0326	85 C, 5.5 VOLTS	50 KCYS	50	0	
WRITE CYCLE STRESS	9950	85 C, 7.0 VOLTS	50 KCYS	50	0	
					Total:	0

FAILURE RATE: **MTTF (YRS): 60577**

FITS: 1.9

D/C 0326 O/L: Open Stitch Bond FA#30020537

D/C 0326 T/C: Open Stitch Bond FA#30018139