

RELIABILITY REPORT  
FOR

**DS1110, Rev B2, and DS1110L, Rev B2, Product Qualifcation**

**Dallas Semiconductor**

4401 South Beltwood Parkway  
Dallas, TX 75244-3292

Prepared by:

*Ken Wendel*

Ken Wendel  
Reliability Engineering Manager  
Dallas Semiconductor  
4401 South Beltwood Pkwy.  
Dallas, TX 75244-3292  
Email : ken.wendel@dalsemi.com  
ph: 972-371-3726  
fax: 972-371-6016  
mbl: 214-435-6610

**Conclusion:**

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

DS1110, Rev B2, and DS1110L, Rev B2, Product Qualification

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](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 is:

**FAILURE RATE:**                      **MTTF (YRS): 3158**                      **FITS: 36.1**

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.

**Device Information:**

Device: DS1110  
 Process: 2P,2M,0.6um,E2,ZTC P1R,P2Cap,DSD,HP Vts, WJ BPSG  
 Passivation: Passivation w/Nov TEOS Oxide-Nitride  
 Die Size: 83 x 69  
 Number of Transistors:  
 Interconnect: Aluminum / 1% Silicon / 0.5% Copper  
 Gate Oxide Thickness: 150 Å

**Assembly Information:**

Qualification Vehicle: DS1110  
 Assembly Site: ATP (Amkor, PI)  
 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: 0223 to 0223

**HIGH TEMPERATURE OPERATING LIFE**

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
HIGH VOLTAGE LIFE	0223	125C, 6.0 VOLTS	336 HOURS	80	0

**Total: 0**

---

**STORAGE LIFE**

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
STORAGE LIFE	0223	150C	336 HOURS	77	0
<b>Total:</b>					<b>0</b>

---

**Assembly Information:**

Qualification Vehicle: DS1110L  
Assembly Site: Carsem  
Pin Count: 14  
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: 0224 to 0224

---

**ELECTRICAL CHARACTERIZATION**

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
ESD SENSITIVITY	0224	EOS/ESD S5.1 HBM 4000 VOLTS	1 PULSES	3	0
ESD SENSITIVITY	0224	EOS/ESD S5.1 HBM 8000 VOLTS	1 PULSES	3	3
LATCH-UP	0224	JESD78, I-TEST 125C		3	0
LATCH-UP	0224	JESD78, Vsupply TEST 125C		3	0
<b>Total:</b>					<b>3</b>

**FAILURE RATE: MTTF (YRS): 3158 FITS: 36.1**