

RELIABILITY REPORT
FOR

DS1073, Rev A2

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:

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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): 29526** **FITS: 3.9**

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.

Device Information:

Process: D8W-1P1M,HPVt,E2,TCN0 LOCOS:GOI
 Passivation: Passivation w/Nov TEOS Oxide-Nitride
 Die Size: 75 x 106
 Number of Transistors: 6035
 Interconnect: Aluminum / 1% Silicon / 0.5% Copper
 Gate Oxide Thickness: 175 Å

Assembly Information:

Assembly Site: ATP (Amkor, PI)
 Pin Count: 8
 Package Type: SOIC
 Body Size: 150x1.4
 Mold Compound: Sumitomo 6300H w/Q3-6646 Die Coat
 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 4
 Date Code Range: 0032 to 0104

OPERATING LIFE

| DESCRIPTION | DATE CODE | CONDITION | READPOINT | QUANTITY | FAILS |
|-------------------|-----------|-----------------|-----------|----------|----------|
| INFANT LIFE | 0032 | 125C, 5.5 VOLTS | 48 HRS | 295 | 0 |
| HIGH VOLTAGE LIFE | 0032 | 125C, 5.5 VOLTS | 1000 HRS | 106 | 0 |
| INFANT LIFE | 0104 | 125C, 5.5 VOLTS | 48 HRS | 315 | 0 |
| HIGH VOLTAGE LIFE | 0104 | 125C, 5.5 VOLTS | 1000 HRS | 116 | 0 |
| Total: | | | | | 0 |

PRECONDITIONING LEVEL 4

| DESCRIPTION | DATE CODE | CONDITION | READPOINT | QUANTITY | FAILS |
|-------------------|-----------|--------------|---------------|----------|----------|
| STORAGE LIFE | 0104 | 125C | 24 HRS | 315 | |
| MOISTURE SOAK | | 30C/60% R.H. | 120 HRS | 315 | |
| CONVECTION REFLOW | | 235C | 3 PASS | 315 | 0 |
| | | | Total: | | 0 |

TEMPERATURE CYCLE

| DESCRIPTION | DATE CODE | CONDITION | READPOINT | QUANTITY | FAILS |
|-------------|-----------|--------------|---------------|----------|----------|
| TEMP CYCLE | 0032 | -55C TO 125C | 1000 CYS | 77 | 0 |
| TEMP CYCLE | 0104 | -55C TO 125C | 1000 CYS | 77 | 0 |
| | | | Total: | | 0 |

TEMPERATURE HUMIDITY BIAS

| DESCRIPTION | DATE CODE | CONDITION | READPOINT | QUANTITY | FAILS |
|-------------|-----------|--------------------|---------------|----------|----------|
| HAST | 0032 | 130C, 85%R.H.,5.5V | 100 HRS | 67 | 0 |
| HAST | 0104 | 130C, 85%R.H.,5.5V | 100 HRS | 77 | 0 |
| | | | Total: | | 0 |

UNBIASED MOISTURE RESISTANCE

| DESCRIPTION | DATE CODE | CONDITION | READPOINT | QUANTITY | FAILS |
|-------------|-----------|-----------------------------|---------------|----------|----------|
| AUTOCLAVE | 0032 | 121C, 2 ATM STEAM, UNBIASED | 168 HRS | 45 | 0 |
| AUTOCLAVE | 0104 | 121C, 2 ATM STEAM, UNBIASED | 168 HRS | 45 | 1 |
| | | | Total: | | 1 |

FAILURE RATE: MTTF (YRS): 29526 FITS: 3.9