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**RELIABILITY REPORT**
**FOR**

# DS2172, Rev A2

## Dallas Semiconductor

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**Conclusion:**

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

DS2172, 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): 19907 FITS: 5.7**

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. A 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: | DS2172 |
| Process: | 1P, 3M, 0.8um, HP Vts , N+ESDII, WJ BPSG, |
| Passivation: | Passivation w/Nov TEOS Oxide-Nitride |
| Die Size: | 118 x 125 |
| Number of Transistors: | 21000 |
| Interconnect: | Aluminum / 1% Silicon / 0.5% Copper |
| Gate Oxide Thickness: | 175 Å |

**Assembly Information:**

| | |
|---|---|
| Qualification Vehicle: | DS2172 |
| Assembly Site: | ATK (Amkor, K) |
| Pin Count: | 32 |
| Package Type: | TQFP |
| Body Size: | 7x7x1 |
| Mold Compound: | Sumitomo 7320CR |
| Lead Frame: | C18045 w/Ag Spot |
| 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 3 |
| Date Code Range: | 9526 to 9828 |

**MOISTURE SENSITIVITY LEVEL 4**

| DESCRIPTION | DATE CODE | CONDITION | READPOINT | | QTY | FAILS | FA# |
|---|---|---|---|---|---|---|---|
| PRECONDITION U/S | 9526 | J-STD-020 | 175 | DYS | 8 | 0 | |
| ULTRASOUND | | J-STD-020 | 175 | DYS | 8 | 0 | |
| STORAGE LIFE | | 125C | 24 | HRS | 8 | | |
| MOISTURE SOAK | | 30C/60% R.H. | 144 | HRS | 8 | | |
| SOLDER HEAT | | HTC VAPOR PHASE | 3 | PASS | 8 | 0 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| EXTERNAL VISUAL | 9526 | MIL-STD-883-2009 | 174 | DYS | 8 | 0 |
| PRECONDITION U/S | 9538 | J-STD-020 | 175 | DYS | 8 | 0 |
| ULTRASOUND | | J-STD-020 | 175 | DYS | 8 | 0 |
| STORAGE LIFE | | 125C | 24 | HRS | 8 | |
| MOISTURE SOAK | | 30C/60% R.H. | 144 | HRS | 8 | |
| SOLDER HEAT | | HTC VAPOR PHASE | 3 | PASS | 8 | 0 |
| EXTERNAL VISUAL | | MIL-STD-883-2009 | 174 | DYS | 8 | 0 |
| | | | | **Total:** | | **0** |

**OPERATING LIFE**

| DESCRIPTION | DATE CODE | CONDITION | READPOINT | | QTY | FAILS | FA# |
|---|---|---|---|---|---|---|---|
| INFANT LIFE | 9526 | 125C, 7.0 VOLTS | 48 | HRS | 270 | 0 | |
| HIGH VOLTAGE LIFE | 9526 | 125C, 7.0 VOLTS | 1000 | HRS | 116 | 0 | |
| INFANT LIFE | 9638 | 125C, 7.0 VOLTS | 48 | HRS | 270 | 0 | |
| HIGH VOLTAGE LIFE | 9638 | 125C, 7.0 VOLTS | 1000 | HRS | 116 | 1 | No FA |
| HIGH VOLTAGE LIFE | 9828 | 125C, 7.0 VOLTS | 1000 | HRS | 116 | 0 | |
| | | | | **Total:** | | **1** | |

**POOR MAN'S HAST**

| DESCRIPTION | DATE CODE | CONDITION | READPOINT | | QTY | FAILS | FA# |
|---|---|---|---|---|---|---|---|
| AUTOCLAVE | 9526 | 121C, 2 ATM STEAM, UNBIASED | 168 | HRS | 77 | 0 | |
| BIASED BAKE | | 25 C, 5.5 VOLTS | 336 | HRS | 77 | 0 | |
| HAST, NO BIAS | 9638 | 120C, 85% R.H. | 200 | HRS | 69 | 0 | |
| BIASED BAKE | | 25 C, 5.5 VOLTS | 368 | HRS | 69 | 0 | |
| | | | | **Total:** | | **0** | |

**PRECONDITIONING LEVEL 4**

| DESCRIPTION | DATE CODE | CONDITION | READPOINT | | QTY | FAILS | FA# |
|---|---|---|---|---|---|---|---|
| STORAGE LIFE | 9526 | 125C | 24 | HRS | 270 | | |
| MOISTURE SOAK | | 30C/60% R.H. | 144 | HRS | 270 | | |
| SOLDER HEAT | | HTC VAPOR PHASE | 3 | PASS | 270 | 0 | |
| | | | | **Total:** | | **0** | |

**TEMPERATURE CYCLE**

| DESCRIPTION | DATE CODE | CONDITION | READPOINT | | QTY | FAILS | FA# |
|---|---|---|---|---|---|---|---|
| TEMP CYCLE | 9526 | -55C TO 125C | 1000 | CYS | 77 | 0 | |
| TEMP CYCLE | 9638 | -55C TO 125C | 1000 | CYS | 75 | 0 | |
| TEMP CYCLE | 9828 | -55C TO 125C | 1000 | CYS | 77 | 0 | |
| | | | | **Total:** | | **0** | |

**FAILURE RATE:** **MTTF (YRS): 19907** **FITS: 5.7**