

RELIABILITY REPORT
FOR

DS3903, Rev A1

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:

DS3903, Rev A1

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): 9400** **FITS: 12.1**

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: DS3903
 Process: D6W-2P2M,HPVt,E2,EPROGVt,TCZ PBL:GOI
 Passivation: Passivation w/Nov TEOS Oxide-Nitride
 Die Size: 104 x 54
 Number of Transistors: 7000
 Interconnect: Aluminum / 1% Silicon / 0.5% Copper
 Gate Oxide Thickness: 150 Å

Assembly Information:

Qualification Vehicle: DS3903
 Assembly Site: Carsem
 Pin Count: 20
 Package Type: TSSOP
 Body Size: 4.4x0.9
 Mold Compound: Shinetsu 184
 Lead Frame: Stamped Copper C7025
 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: 0223 to 0223

EEPROM WRITE/ERASE ENDURANCE AND DATA RETENTION

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
WRITE CYCLE STRESS	0223	85 C, 6.0 VOLTS	10 KCYCLS	76	0
STORAGE LIFE		150C	1000 HOURS	76	0
			Total:		0

ELECTRICAL CHARACTERIZATION

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
ESD SENSITIVITY	0223	EOS/ESD S5.1 HBM 500 VOLTS	1	PULSES	3 0
ESD SENSITIVITY	0223	EOS/ESD S5.1 HBM 1000 VOLTS	1	PULSES	3 0
ESD SENSITIVITY	0223	EOS/ESD S5.1 HBM 2000 VOLTS	1	PULSES	3 1
ESD SENSITIVITY	0223	EOS/ESD S5.1 HBM 4000 VOLTS	1	PULSES	3 2
ESD SENSITIVITY	0223	EOS/ESD S5.1 HBM 8000 VOLTS	1	PULSES	3 3
LATCH-UP	0223	JESD78, I-TEST 125C			3 3
LATCH-UP	0223	JESD78, Vsupply TEST 125C			3 0
LATCH-UP	0223	JESD78, I-TEST 85C			3 0
				Total:	9

HIGH TEMPERATURE OPERATING LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
HIGH VOLTAGE LIFE	0223	125C, 6.0 VOLTS	1000	HOURS	80 0
				Total:	0

FAILURE RATE: MTTF (YRS): 9400 FITS: 12.1