

RELIABILITY REPORT
FOR

Dallas 8", Large Bump, w/ or w/o Underfill, and/or w/Glob,
TiW/NiV/Cu UBM, 5u BCB, DS2502, Rev D3 (DS25M02, Rev C3)

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:

Large Bump, w/ or w/o Underfill, and/or w/Glob, TiW/NiV/Cu UBM, 5u BCB, DS2502, Rev D3 (DS25M0

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 assembly 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): 7667** **FITS: 14.9**

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. Some of the data in this report may be generic. At the start of this data is a description of the assembly vehicle used to generate this reliability data. The next section is the detailed reliability data for each stress. If there are additional assemblies used as part of this report, a description of each will follow which includes the respective reliability data for that assembly. The reliability data section includes the latest data available.

Assembly Information:

Assembly Site: Dallas-8"
 Pin Count: 2
 Package Type: Bump, 1 layer, glob
 Body Size: 18
 Mold Compound: ?
 Lead Frame: 95Pb:5Sn Solder
 Lead Finsh:
 Die Attach: Glob Top 4323, Dexter Hysol
 Bond Wire / Size: /
 Flammability: UL 94-V0
 Moisture Sensitivity (JEDEC J-STD20A) Level 1
 Date Code Range: 0413 to 0413

TEMPERATURE CYCLE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
TEMP CYCLE	0413	-40 TO 85C	1000 CYS	80	0
TEMP CYCLE	0413	-40 TO 85C	1000 CYS	80	0
Total:					0

Assembly Information:

Assembly Site: Dallas-8"
 Pin Count: 2
 Package Type: Bump, 1 layer, no encap.
 Body Size: 18
 Mold Compound: ?
 Lead Frame: 95Pb:5Sn Solder
 Lead Finsh:
 Die Attach: No Underfill
 Bond Wire / Size: /
 Flammability: UL 94-V0
 Moisture Sensitivity (JEDEC J-STD20A) Level 1
 Date Code Range: 0403 to 0414

OPERATING LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
HIGH TEMP OP LIFE	0403	125C, 5.5 VOLTS	1000 HRS	48	0
HIGH TEMP OP LIFE	0403	125C, 5.5 VOLTS	1000 HRS	48	1
HIGH TEMP OP LIFE	0403	125C, 5.5 VOLTS	1000 HRS	48	0
Total:					1

STORAGE LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
STORAGE LIFE	0403	125C	1000 HRS	80	0
STORAGE LIFE	0403	125C	1000 HRS	80	0
STORAGE LIFE	0403	125C	1000 HRS	80	0
Total:					0

TEMPERATURE CYCLE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
TEMP CYCLE	0409	-40 TO 85C	1000 CYS	80	0
TEMP CYCLE	0414	-40 TO 85C	1000 CYS	80	1
TEMP CYCLE	0414	-40 TO 85C	1000 CYS	80	0
Total:					1

TEMPERATURE HUMIDITY BIAS

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
BIASED MOISTURE	0403	85/85, 5.5 VOLTS	1000 HRS	80	0
BIASED MOISTURE	0403	85/85, 5.5 VOLTS	1000 HRS	80	0
BIASED MOISTURE	0403	85/85, 5.5 VOLTS	1000 HRS	80	0
Total:					0

UNBIASED MOISTURE RESISTANCE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
AUTOCLAVE	0403	121C, 2 ATM STEAM, UNBIASED	168 HRS	80	0
AUTOCLAVE	0403	121C, 2 ATM STEAM, UNBIASED	168 HRS	80	0
AUTOCLAVE	0403	121C, 2 ATM STEAM, UNBIASED	168 HRS	80	0
Total:					0

Assembly Information:

Assembly Site: Dallas-8"
Pin Count: 2
Package Type: Bump, 1 layer, underfill
Body Size: 18
Mold Compound: ?
Lead Frame: 95Pb:5Sn Solder
Lead Finsh:
Die Attach: Underfill FP4549, Dexter Hysol
Bond Wire / Size: /
Flammability: UL 94-V0
Moisture Sensitivity (JEDEC J-STD20A) Level 1
Date Code Range: 0413 to 0413

TEMPERATURE CYCLE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
TEMP CYCLE	0413	-40 TO 85C	1000 CYS	80	0
TEMP CYCLE	0413	-40 TO 85C	1000 CYS	80	0
			Total:		0

FAILURE RATE: MTTF (YRS): 7667 FITS: 14.9

Op Life 500 hr Failure: Input load current due to Gate Oxide Failure
T/C 500~ Failure: Array failure due to passivation damage/crack at edge of bump.