DALLAS SEMICONDUCTOR MAXIM

02/24/2004

RELIABILITY REPORT
FOR

DS1306, 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:

DS1306, 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): 25498** **FITS: 4.5**

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.

Device Information:

Device:	DS1306
Process:	1P, 2M, 0.8um, ESD Pdepletion,HP Vts,WJ BPSG,Ti/TiN M1
Passivation:	Passivation w/Nov TEOS Oxide-Nitride
Die Size:	75 x 98
Number of Transistors:	0
Interconnect:	Aluminum / 1% Silicon / 0.5% Copper
Gate Oxide Thickness:	175 Å

Assembly Information:

Qualification Vehicle:	DS1306
Assembly Site:	ATP (Amkor, PI)
Pin Count:	20
Package Type:	TSSOP
Body Size:	4.4x0.9
Mold Compound:	Sumitomo 7351T
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 (JEDEC J-STD20A)	Level 1
Date Code Range:	9732 to 9803

MOISTURE SENSITIVITY LEVEL 1

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
EXTERNAL VISUAL	9732	MIL-STD-883-2009	1	DYS	8	0
ULTRASOUND		J-STD-020	2	DYS	8	0
ULTRASOUND	9803	J-STD-020	2	DYS	8	0
STORAGE LIFE		125C	26	HRS	7	

MOISTURE SOAK	9803	85 C/85% R.H.	194	HRS	7	
SOLDER HEAT		HTC VAPOR PHASE	3	PASS	7	
EXTERNAL VISUAL		MIL-STD-883-2009	198	DYS	8	0
PRECONDITION U/S		J-STD-020	199	DYS	7	0
				Total:		**0**

OPERATING LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
HIGH VOLTAGE LIFE	9732	125C, 6.0 VOLTS	1000	HRS	116	0
HIGH TEMP OP LIFE	9803	125C, 5.5 VOLTS	1000	HRS	101	0
				Total:		**0**

PACKAGE TESTS

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
CONSTRUCTION ANALY	9803	TO BE DONE BY F/A	1	WKS	5	
SOLDERABILITY	9803	MIL-STD-883-2003	1	DYS	3	0
X-RAY	9803	MIL-STD-883-2012 : TOP & SIDE VIEW	1	DYS	6	
PHYSICAL DIMENSIONS		MIL-STD-883-2016	2	DYS	6	
MARK PERMANENCY		MIL-STD-883-2015	3	DYS	6	
LEAD INTEGRITY		MIL-STD-883-2004 : COND B2	4	DYS	6	0
				Total:		**0**

PRECONDITIONING LEVEL 1

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
STORAGE LIFE	9732	125C	24	HRS	315	
MOISTURE SOAK		85 C/85% R.H.	168	HRS	315	
SOLDER HEAT		HTC VAPOR PHASE	3	PASS	315	0
STORAGE LIFE	9803	125C	24	HRS	315	
MOISTURE SOAK		85 C/85% R.H.	168	HRS	315	
SOLDER HEAT		HTC VAPOR PHASE	3	PASS	315	0
				Total:		**0**

TEMPERATURE CYCLE

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
TEMP CYCLE	9732	-55C TO 125C	1000	CYS	76	0
TEMP CYCLE	9732	-65C TO 150C	100	CYS	77	0
AUTOCLAVE		121C, 2 ATM STEAM, UNBIASED	124	HRS	77	0
TEMP CYCLE	9803	-55C TO 125C	1000	CYS	77	0
				Total:		**0**

TEMPERATURE HUMIDITY BIAS

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
HAST	9732	120C, 85%R.H.,5.5V	48	HRS	77	0
BIASED MOISTURE	9803	85/85, 5.5 VOLTS	959	HRS	77	0
				Total:		**0**

UNBIASED MOISTURE RESISTANCE

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
AUTOCLAVE	9732	121C, 2 ATM STEAM, UNBIASED	168	HRS	44	0

AUTOCLAVE	9803	121C, 2 ATM STEAM, UNBIASED	168	HRS	45	0
				Total:		**0**

FAILURE RATE: **MTTF (YRS): 25498** **FITS: 4.5**