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RELIABILITY REPORT
FOR

DS1004, Rev E1

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:

DS1004, Rev E1

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): 48781 FITS: 2.3

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:	DS1000
Process:	1P, 1M, 1.2um, Ndepletion , TEOS SP, WJ BPSG,
Passivation:	Laser/Nit - Pass/Nit - General LaserPrb
Die Size:	83 x 71
Number of Transistors:	677
Interconnect:	Aluminum / 1% Silicon / 0.5% Copper
Gate Oxide Thickness:	225 Å

Assembly Information:

Qualification Vehicle:	DS1000
Assembly Site:	CPS (ChipPac, China)
Pin Count:	8
Package Type:	PDIP
Body Size:	300
Mold Compound:	Sumitomo 6300H
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)	
Date Code Range:	9730 to 0018

HIGH TEMPERATURE OPERATING LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
INFANT LIFE	0002	125C, 7.0 VOLTS	48	HOURS	234	0

HIGH VOLTAGE LIFE	0002	125C, 7.0 VOLTS	1000	HOURS	77	0
INFANT LIFE	0009	125C, 7.0 VOLTS	48	HOURS	234	0
HIGH VOLTAGE LIFE	0009	125C, 7.0 VOLTS	1000	HOURS	77	0
INFANT LIFE	9730	125C, 7.0 VOLTS	48	HOURS	314	0
OP-LIFE	9730	125C, 5.5 VOLTS	1000	HOURS	116	0
INFANT LIFE	9847	125C, 7.0 VOLTS	48	HOURS	234	0
HIGH VOLTAGE LIFE	9847	125C, 7.0 VOLTS	1000	HOURS	77	0
INFANT LIFE	9944	125C, 7.0 VOLTS	48	HOURS	234	1
HIGH VOLTAGE LIFE	9944	125C, 7.0 VOLTS	1000	HOURS	77	0
				Total:		**1**

PACKAGE TESTS

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
SOLDERABILITY	9730	MIL-STD-883-2003			3	0
X-RAY	9730	MIL-STD-883-2012 : TOP & SIDE VIEW			6	
PHYSICAL DIMENSIONS		MIL-STD-883-2016			6	
MARK PERMANENCY		MIL-STD-883-2015			6	
LEAD INTEGRITY		MIL-STD-883-2004 : COND B2			6	0
				Total:		**0**

PRECONDITIONING LEVEL 1

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
STORAGE LIFE	0018	125C	24	HOURS	45	
MOISTURE SOAK		85 C/85% R.H.	168	HOURS	45	
VAPOR PHASE REFLOW		220C	3	PASS	45	0
				Total:		**0**

TEMPERATURE CYCLE

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
TEMP CYCLE	0002	-55C TO 125C	1000	CYCLES	40	0
TEMP CYCLE	0009	-55C TO 125C	1000	CYCLES	40	0
TEMP CYCLE	9730	-55C TO 125C	1000	CYCLES	77	0
TEMP CYCLE	9847	-55C TO 125C	1000	CYCLES	40	0
TEMP CYCLE	9944	-55C TO 125C	1000	CYCLES	40	0
				Total:		**0**

TEMPERATURE HUMIDITY BIAS

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
BIASED MOISTURE	0002	85/85, 5.5 VOLTS	959	HOURS	77	0
BIASED MOISTURE	0009	85/85, 5.5 VOLTS	959	HOURS	77	0
BIASED MOISTURE	9730	85/85, 5.5 VOLTS	959	HOURS	77	0
BIASED MOISTURE	9847	85/85, 5.5 VOLTS	959	HOURS	77	0

BIASED MOISTURE	9944	85/85, 5.5 VOLTS	959	HOURS	77	0
				Total:		**0**

UNBIASED MOISTURE RESISTANCE

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
AUTOCLAVE	0002	121C, 2 ATM STEAM, UNBIASED	96	HOURS	40	0
AUTOCLAVE	0009	121C, 2 ATM STEAM, UNBIASED	96	HOURS	40	0
AUTOCLAVE	9730	121C, 2 ATM STEAM, UNBIASED	168	HOURS	44	0
AUTOCLAVE	9847	121C, 2 ATM STEAM, UNBIASED	96	HOURS	40	0
AUTOCLAVE	9944	121C, 2 ATM STEAM, UNBIASED	96	HOURS	38	0
				Total:		**0**

Assembly Information:

Qualification Vehicle:	DS1000
Assembly Site:	Omedata
Pin Count:	8
Package Type:	PDIP
Body Size:	0
Mold Compound:	?
Lead Frame:	?
Lead Finsh:	
Die Attach:	?
Bond Wire / Size:	/
Flammability:	UL 94-V0
Moisture Sensitivity (JEDEC J-STD20A)	
Date Code Range:	9642 to 9750

HIGH TEMPERATURE OPERATING LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
INFANT LIFE	9642	125C, 7.0 VOLTS	48	HOURS	231	0
HIGH VOLTAGE LIFE	9642	125C, 7.0 VOLTS	1000	HOURS	77	0
INFANT LIFE	9649	125C, 7.0 VOLTS	48	HOURS	231	0
HIGH VOLTAGE LIFE	9649	125C, 7.0 VOLTS	1000	HOURS	77	0
INFANT LIFE	9710	125C, 7.0 VOLTS	48	HOURS	231	0
HIGH VOLTAGE LIFE	9710	125C, 7.0 VOLTS	1000	HOURS	77	0
HIGH VOLTAGE LIFE	9725	125C, 7.0 VOLTS	1000	HOURS	153	0
INFANT LIFE	9725	125C, 7.0 VOLTS	48	HOURS	231	0
HIGH VOLTAGE LIFE	9725	125C, 7.0 VOLTS	1000	HOURS	77	0
INFANT LIFE	9727	125C, 7.0 VOLTS	48	HOURS	234	0
HIGH VOLTAGE LIFE	9727	125C, 7.0 VOLTS	1000	HOURS	77	0
INFANT LIFE	9750	125C, 7.0 VOLTS	48	HOURS	234	0
HIGH VOLTAGE LIFE	9750	125C, 7.0 VOLTS	1000	HOURS	77	0

					Total:	**0**

TEMPERATURE CYCLE

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
TEMP CYCLE	9642	-55C TO 125C	1000	CYCLES	39	0
TEMP CYCLE	9649	-55C TO 125C	1000	CYCLES	39	0
TEMP CYCLE	9710	-55C TO 125C	1000	CYCLES	39	0
TEMP CYCLE	9725	-55C TO 125C	1000	CYCLES	39	0
TEMP CYCLE	9727	-55C TO 125C	1000	CYCLES	40	0
TEMP CYCLE	9750	-55C TO 125C	1000	CYCLES	40	0
				Total:		**0**

TEMPERATURE HUMIDITY BIAS

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
BIASED MOISTURE	9642	85/85, 5.5 VOLTS	959	HOURS	77	0
BIASED MOISTURE	9649	85/85, 5.5 VOLTS	959	HOURS	77	0
BIASED MOISTURE	9710	85/85, 5.5 VOLTS	959	HOURS	77	0
BIASED MOISTURE	9725	85/85, 5.5 VOLTS	959	HOURS	77	0
BIASED MOISTURE	9727	85/85, 5.5 VOLTS	959	HOURS	77	0
BIASED MOISTURE	9750	85/85, 5.5 VOLTS	959	HOURS	77	0
				Total:		**0**

UNBIASED MOISTURE RESISTANCE

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
AUTOCLAVE	9642	121C, 2 ATM STEAM, UNBIASED	96	HOURS	38	0
AUTOCLAVE	9649	121C, 2 ATM STEAM, UNBIASED	96	HOURS	38	0
AUTOCLAVE	9710	121C, 2 ATM STEAM, UNBIASED	96	HOURS	38	0
AUTOCLAVE	9725	121C, 2 ATM STEAM, UNBIASED	96	HOURS	38	0
AUTOCLAVE	9727	121C, 2 ATM STEAM, UNBIASED	96	HOURS	40	0
AUTOCLAVE	9750	121C, 2 ATM STEAM, UNBIASED	96	HOURS	40	0
				Total:		**0**

Assembly Information:

Qualification Vehicle:	DS1000
Assembly Site:	ATK (Amkor, K)
Pin Count:	8
Package Type:	SOIC
Body Size:	150x1.4
Mold Compound:	Shinetsu 184
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 1
Date Code Range:	9420 to 9420

HIGH TEMPERATURE OPERATING LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
HIGH VOLTAGE LIFE	9420	125C, 7.0 VOLTS	1000	HOURS	153	1
				Total:		**1**

TEMPERATURE HUMIDITY BIAS

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
BIASED MOISTURE	9420	85/85, 5.5 VOLTS	959	HOURS	77	0
				Total:		**0**

Assembly Information:

Qualification Vehicle:	DS1000
Assembly Site:	OSEP
Pin Count:	8
Package Type:	SOIC
Body Size:	150x1.4
Mold Compound:	Sumitomo 6300H
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 1
Date Code Range:	0033 to 0034

HIGH TEMPERATURE OPERATING LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
INFANT LIFE	0033	125C, 7.0 VOLTS	48	HOURS	232	0
HIGH VOLTAGE LIFE	0033	125C, 7.0 VOLTS	1000	HOURS	77	0
				Total:		**0**

MOISTURE SENSITIVITY LEVEL 1

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS

EXTERNAL VISUAL	0034	MIL-STD-883-2009			8	0
ULTRASOUND		J-STD-020			8	0
STORAGE LIFE		125C	24	HOURS	8	
MOISTURE SOAK		85 C/85% R.H.	168	HOURS	8	
CONVECTION REFLOW		235C	3	PASS	8	0
PRECONDITION U/S		J-STD-020			8	0
EXTERNAL VISUAL		MIL-STD-883-2009			8	0
EXTERNAL VISUAL	0034	MIL-STD-883-2009			8	0
ULTRASOUND		J-STD-020			8	0
STORAGE LIFE		125C	24	HOURS	8	
MOISTURE SOAK		85 C/85% R.H.	168	HOURS	8	
CONVECTION REFLOW		235C	3	PASS	8	1
PRECONDITION U/S		J-STD-020			8	0
				Total:		**1**

PACKAGE TESTS

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
SOLDERABILITY	0034	MIL-STD-883-2003			3	0
X-RAY	0034	MIL-STD-883-2012 : TOP & SIDE VIEW			6	0
PHYSICAL DIMENSIONS		MIL-STD-883-2016			6	0
MARK PERMANENCY		MIL-STD-883-2015			6	0
LEAD INTEGRITY		MIL-STD-883-2004 : COND B2			6	0
SOLDERABILITY	0034	MIL-STD-883-2003			3	0
X-RAY	0034	MIL-STD-883-2012 : TOP & SIDE VIEW			6	0
PHYSICAL DIMENSIONS		MIL-STD-883-2016			6	0
MARK PERMANENCY		MIL-STD-883-2015			6	0
LEAD INTEGRITY		MIL-STD-883-2004 : COND B2			6	0
				Total:		**0**

PRECONDITIONING LEVEL 1

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
STORAGE LIFE	0034	125C	24	HOURS	309	
MOISTURE SOAK		85 C/85% R.H.	168	HOURS	309	
CONVECTION REFLOW		235C	3	PASS	309	2
STORAGE LIFE	0034	125C	24	HOURS	309	
MOISTURE SOAK		85 C/85% R.H.	168	HOURS	309	
CONVECTION REFLOW		235C	3	PASS	309	7
				Total:		**9**

TEMPERATURE CYCLE

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
TEMP CYCLE	0033	-55C TO 125C	1000	CYCLES	40	0
				Total:		**0**

TEMPERATURE HUMIDITY BIAS

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
BIASED MOISTURE	0033	85/85, 5.5 VOLTS	959	HOURS	77	0

					Total:	**0**

UNBIASED MOISTURE RESISTANCE

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
AUTOCLAVE	0033	121C, 2 ATM STEAM, UNBIASED	96	HOURS	38	0
				Total:		**0**

FAILURE RATE: MTTF (YRS): 48781 FITS: 2.3

The DS1004 was qualified generically with DS1000 data. The fab process for these two devices is the same.