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RELIABILITY REPORT
FOR

DS1099, Rev A3 8"

Maxim Integrated Products

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Conclusion:

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

DS1099, Rev A3 8"

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:

$$\text{MTTF} = 1/\text{Fr}$$

NOTE: MTTF is frequently used interchangeably with MTBF.

The calculated failure rate for this device/process/assembly is:

FAILURE RATE:	MTTF (YRS):	4961	FITS:	23.0
	DEVICE HOURS:	42216	FAILS:	0

Only data from Operating Life or similar stresses are used for this calculation.

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 for this report. 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 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.

Device Information:

Device: DS1099
 Process: E35X-3P3M,DPE2,CrSi,DSD,PDES,PDRES,Cap,ENPN,DPT,
 Passivation: TEOS Ox-Nit Passivation for E35X; Full BEOL at SA; PT only in
 Die Size: 35 x 58
 Number of Transistors: 4256
 Interconnect: Aluminum / 0.5% Copper
 Gate Oxide Thickness: 120 Å

Assembly Information:

Qualification Vehicle: DS1099
 Assembly Site: Unisem
 Pin Count: 8
 Package Type: uSOP (Pb-Free)
 Body Size: 3x0.85
 Mold Compound: Sumitomo G600
 Lead Frame: Stamped Copper CDA194
 Lead Finsh: Sn Plate 100% Matte (With Anneal Bake)
 Die Attach: 8290 Ablestik
 Bond Wire / Size: Au / 1.0 mil
 Theta JA: 221
 Theta JC: 39
 Flammability: UL 94-V0
 Moisture Sensitivity (JEDEC J-STD20A) Level 1
 Date Code Range: 0745 to 0745

OPERATING LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QTY	FAILS	FA#
HIGH TEMP OP LIFE	0745	125C, 5.5 VOLTS	240 HRS	45	0	

Total: 0

Assembly Information:

Qualification Vehicle: DS1099
Assembly Site: UTL (NSEB) UTAC Thailand
Pin Count: 8
Package Type: uSOP (Pb-Free) Automotive
Body Size: 3x0.85
Mold Compound: Sumitomo G600
Lead Frame: Stamped Copper CDA194
Lead Finsh: Sn Plate 100% Matte (With Anneal Bake)
Die Attach: 8200T Ablebond Silverfiled Epoxy
Bond Wire / Size: Au / 1.0 mil
Theta JA:
Theta JC:
Flammability: UL 94-V0
Moisture Sensitivity (JEDEC J-STD20A) Level 1
Date Code Range: 0732 to 0732

ELECTRICAL CHARACTERIZATION

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QTY	FAILS	FA#
ESD SENSITIVITY	0732	EOS/ESD S5.1 HBM 500 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0732	EOS/ESD S5.1 HBM 1000 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0732	EOS/ESD S5.1 HBM 2000 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0732	EOS/ESD S5.1 HBM 3000 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0732	EOS/ESD S5.1 HBM 4000 VOLTS	1 PUL'S	3	0	
LATCH-UP	0732	JESD78, I-TEST 125C		6	0	
LATCH-UP	0732	JESD78, V-SUPPLY TEST 125C		6	0	
ESD SENSITIVITY	0732	JESD22-C101 CDM 100 VOLTS	5 PUL'S	3	0	
ESD SENSITIVITY	0732	JESD22-C101 CDM 200 VOLTS	5 PUL'S	3	0	
ESD SENSITIVITY	0732	JESD22-C101 CDM 500 VOLTS	5 PUL'S	3	0	
ESD SENSITIVITY	0732	JESD22-C101 CDM 1000 VOLTS	5 PUL'S	3	2	No FA
ESD SENSITIVITY	0732	JESD22-C101 CDM 2000 VOLTS	5 PUL'S	3	3	No FA
ESD SENSITIVITY	0732	JESD22-A115 MM 50 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0732	JESD22-A115 MM 100 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0732	JESD22-A115 MM 200 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0732	JESD22-A115 MM 400 VOLTS	1 PUL'S	3	3	No FA
Total:					8	

MOISTURE SENSITIVITY LEVEL 1

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QTY	FAILS	FA#
ULTRASOUND	0732	J-STD-020		8	0	
STORAGE LIFE		125C	24 HRS	8		
MOISTURE SOAK		85 C/85% R.H.	168 HRS	8		
CONVECTION REFLOW		260C +/-5C	3 PASS	8	0	

EXTERNAL VISUAL	0732	J-STD-020, 6.1a			8	0
PRECONDITION U/S		J-STD-020			8	0
Total:					0	0

OPERATING LIFE

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
HIGH TEMP OP LIFE	0732		125C, 5.5 VOLTS	408 HRS	45	0	
HIGH TEMP OP LIFE	0732		125C, 5.5 VOLTS	408 HRS	32	0	
Total:					0	0	

PACKAGE TESTS

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
SOLDERABILITY (Pb-Free)	0732		JESD22-B102, COND C		15	0	
SOLDERABILITY (Sn/Pb)			JESD22-B102, COND C		15	0	
EXTERNAL VISUAL	0732		JESD22-B101		10	0	
PHYSICAL DIMENSIONS			JESD22-B100		10	0	
X-RAY			MIL-STD-883-2012 : TOP & SIDE VIEW		10	0	
Total:					0	0	

PRECONDITIONING LEVEL 1

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
STORAGE LIFE	0732		125C	24 HRS	308		
MOISTURE SOAK			85 C/85% R.H.	168 HRS	308		
CONVECTION REFLOW			260C +/-5C	3 PASS	308	0	
Total:					0	0	

STORAGE LIFE

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
STORAGE LIFE	0732		150C	1000 HRS	77	0	
Total:					0	0	

TEMPERATURE CYCLE

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
TEMP CYCLE	0732		-55C TO 125C	1000 CYS	77	0	
BOND STRENGTH			MIL-STD-883-2011 : COND D	30 WIRES	5	0	
Total:					0	0	

TEMPERATURE HUMIDITY BIAS

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
HAST	0732		130C, 85%R.H.,5.5V	96 HRS	77	0	
Total:					0	0	

UNBIASED MOISTURE RESISTANCE

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
AUTOCLAVE	0732		121C, 2 ATM STEAM, UNBIASED	168 HRS	77	0	
Total:					0	0	

FAILURE RATE:	MTTF (YRS):	4961	FITS:	23.0
	DEVICE HOURS:	42216	FAILS:	0