03/24/2003

RELIABILITY REPORT
FOR

DS1005, Rev A2

Dallas Semiconductor

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Prepared by:

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Conclusion:

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

DS1005, 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 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): 115454 FITS: 1.0

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. Following this is the assembly information. This section includes 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.

Device Information:

Process:	1P, 1M, 2.0um, Pfield, Ndepletion ,
Passivation:	Laser/Nit - Pass/Nit - General LaserPrb
Die Size:	134 x 90
Number of Transistors:	
Interconnect:	Aluminum / 1% Silicon / 0.5% Copper
Gate Oxide Thickness:	250 Å

HIGH TEMPERATURE OPERATING LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
INFANT LIFE	9527	125C, 7.0 VOLTS	48	HRS	315	0
OP-LIFE	9527	125C, 5.5 VOLTS	1000	HRS	116	0
HIGH VOLTAGE LIFE	9529	125C, 7.0 VOLTS	1000	HRS	307	0
INFANT LIFE	9649	125C, 7.0 VOLTS	48	HRS	296	0
HIGH VOLTAGE LIFE	9649	125C, 7.0 VOLTS	1000	HRS	116	0
HIGH VOLTAGE LIFE	9722	125C, 7.0 VOLTS	1000	HRS	153	0
INFANT LIFE	9721	125C, 7.0 VOLTS	48	HRS	294	0
HIGH VOLTAGE LIFE	9721	125C, 7.0 VOLTS	1000	HRS	116	0
INFANT LIFE	9729	125C, 7.0 VOLTS	48	HRS	315	0
HIGH VOLTAGE LIFE	9729	125C, 7.0 VOLTS	1000	HRS	116	0

TEMPERATURE CYCLE

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
TEMP CYCLE	9527	-55C TO 125C	1000	CYS	77	0
TEMP CYCLE	9649	-55C TO 125C	1000	CYS	77	0
TEMP CYCLE	9721	-55C TO 125C	1000	CYS	76	0
TEMP CYCLE	9729	-55C TO 125C	1000	CYS	77	0
TEMP CYCLE	9933	-40 TO 85C	1000	CYS	77	0

TEMPERATURE HUMIDITY BIAS

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
HAST	9527	120C, 85%R.H.,5.5V	200	HRS	76	1
HAST	9649	120C, 85%R.H.,5.5V	100	HRS	60	0
BIASED MOISTURE	9721	85/85, 5.5 VOLTS	959	HRS	60	1
BIASED MOISTURE	9729	85/85, 5.5 VOLTS	959	HRS	77	0
BIASED MOISTURE	9933	85/85, 5.5 VOLTS	959	HRS	77	1

UNBIASED MOISTURE RESISTANCE

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
AUTOCLAVE	9527	121C, 2 ATM STEAM, UNBIASED	168	HRS	45	0
AUTOCLAVE	9649	121C, 2 ATM STEAM, UNBIASED	168	HRS	43	0
AUTOCLAVE	9721	121C, 2 ATM STEAM, UNBIASED	168	HRS	40	0
AUTOCLAVE	9729	121C, 2 ATM STEAM, UNBIASED	168	HRS	45	0

Assembly Information:

Assembly Site:	ATK (Amkor, K)
Pin Count:	16
Package Type:	SOIC
Body Size:	300x2.3
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:	9430 to 0007

HIGH TEMPERATURE OPERATING LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
INFANT LIFE	0007	125C, 7.0 VOLTS	48	HRS	256	0
HIGH VOLTAGE LIFE	0007	125C, 7.0 VOLTS	1000	HRS	179	0
INFANT LIFE	9430	125C, 7.0 VOLTS	48	HRS	320	0
HIGH VOLTAGE LIFE	9430	125C, 7.0 VOLTS	1000	HRS	153	0
INFANT LIFE	9434	125C, 7.0 VOLTS	48	HRS	355	0
HIGH VOLTAGE LIFE	9434	125C, 7.0 VOLTS	1000	HRS	116	0
INFANT LIFE	9503	125C, 7.0 V & -4.0 V	48	HRS	231	0
HIGH VOLTAGE LIFE	9503	125C, 7.0 V & -4.0 V	1000	HRS	77	2
HIGH VOLTAGE LIFE	9552	125C, 7.0 VOLTS	1000	HRS	153	0
INFANT LIFE	9721	125C, 7.0 VOLTS	96	HRS	770	0
HIGH VOLTAGE LIFE	9721	125C, 7.0 VOLTS	1000	HRS	153	0
INFANT LIFE	9745	125C, 7.0 VOLTS	48	HRS	770	0

HIGH VOLTAGE LIFE	9745	125C, 7.0 VOLTS	1000	HRS	153	0
HIGH VOLTAGE LIFE	9829	125C, 7.0 VOLTS	1000	HRS	116	0
				Total:		**2**

LOW TEMPERATURE OPERATING LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
BIASED BAKE	9434	-20C, 7.0 VOLTS	1000	HRS	77	0
				Total:		**0**

MOISTURE SENSITIVITY LEVEL 1

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
ULTRASOUND	9621	J-STD-020			8	0
STORAGE LIFE		125C	26	HRS	8	
MOISTURE SOAK		85 C/85% R.H.	194	HRS	8	
SOLDER HEAT		HTC VAPOR PHASE	3	PASS	8	
EXTERNAL VISUAL		MIL-STD-883-2009			8	0
PRECONDITION U/S		J-STD-020			8	0
				Total:		**0**

PACKAGE TESTS

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
SOLDERABILITY	9829	MIL-STD-883-2003		3	0
X-RAY	9829	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**

STORAGE LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
STORAGE LIFE	0007	150C	1000	HRS	77	0
				Total:		**0**

TEMPERATURE CYCLE

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
TEMP CYCLE	9430	-55C TO 125C	1000	CYS	77	0
TEMP CYCLE	9434	-55C TO 125C	1000	CYS	77	0
TEMP CYCLE	9503	-55C TO 125C	1000	CYS	77	0
TEMP CYCLE	9721	-55C TO 125C	1000	CYS	77	0
TEMP CYCLE	9829	-55C TO 125C	1000	CYS	70	0
				Total:		**0**

TEMPERATURE HUMIDITY BIAS

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
HAST	9430	120C, 85%R.H.,5.5V	200	HRS	76	0
BIASED MOISTURE	9434	85/85, 5.5 VOLTS	959	HRS	77	1
HAST	9503	120C, 85%R.H.,5.5V	200	HRS	77	0
HAST	9721	120C, 85%R.H.,5.5V	100	HRS	66	0

BIASED MOISTURE	9829	85/85, 5.5 VOLTS	959	HRS	77	0
				Total:		**1**

UNBIASED MOISTURE RESISTANCE

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
AUTOCLAVE	9721	121C, 2 ATM STEAM, UNBIASED	168	HRS	45	0
AUTOCLAVE	9829	121C, 2 ATM STEAM, UNBIASED	168	HRS	45	0
				Total:		**0**

Assembly Information:

Assembly Site:	ATP (Amkor, PI)
Pin Count:	16
Package Type:	SOIC
Body Size:	300x2.3
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:	9722 to 0223

HIGH TEMPERATURE OPERATING LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
HIGH VOLTAGE LIFE	0114	125C, 6.0 VOLTS	1000	HRS	116	0
HIGH VOLTAGE LIFE	0148	125C, 6.0 VOLTS	1000	HRS	80	0
HIGH VOLTAGE LIFE	0223	125C, 6.0 VOLTS	1000	HRS	80	0
INFANT LIFE	9722	125C, 7.0 VOLTS	48	HRS	315	0
OP-LIFE	9722	125C, 5.5 VOLTS	1000	HRS	116	0
HIGH VOLTAGE LIFE	9939	125C, 7.0 VOLTS	1000	HRS	256	1
				Total:		**1**

MOISTURE SENSITIVITY LEVEL 1

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
ULTRASOUND	9722	J-STD-020			8	0
STORAGE LIFE		125C	26	HRS	8	
MOISTURE SOAK		85 C/85% R.H.	194	HRS	8	
SOLDER HEAT		HTC VAPOR PHASE	3	PASS	8	
EXTERNAL VISUAL		MIL-STD-883-2009			8	0
PRECONDITION U/S		J-STD-020			8	0
				Total:		**0**

PACKAGE TESTS

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
CONSTRUCTION ANALY	9722	TO BE DONE BY F/A		0	
X-RAY	9722	MIL-STD-883-2012 : TOP & SIDE VIEW		6	0

X-RAY	9722	MIL-STD-883-2012 : TOP & SIDE VIEW			5	0
				Total:		**0**

PRECONDITIONING LEVEL 1

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
STORAGE LIFE	9722	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**

STORAGE LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
STORAGE LIFE	0223	150C	1000	HRS	77	0
				Total:		**0**

TEMPERATURE CYCLE

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
TEMP CYCLE	9722	-55C TO 125C	1000	CYS	77	0
				Total:		**0**

TEMPERATURE HUMIDITY BIAS

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
BIASED MOISTURE	9722	85/85, 5.5 VOLTS	959	HRS	77	0
				Total:		**0**

UNBIASED MOISTURE RESISTANCE

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
AUTOCLAVE	9722	121C, 2 ATM STEAM, UNBIASED	168	HRS	45	0
				Total:		**0**

Assembly Information:

Assembly Site:	Carsem
Pin Count:	16
Package Type:	SOIC
Body Size:	300x2.3
Mold Compound:	Sumitomo 6300H
Lead Frame:	Stamped copper
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 0037

HIGH TEMPERATURE OPERATING LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
HIGH VOLTAGE LIFE	0037	125C, 6.0 V, -4.0V	1000	HRS	116	1
INFANT LIFE	9420	125C, 7.0 VOLTS	48	HRS	276	0
OP-LIFE	9420	125C, 5.5 VOLTS	1000	HRS	77	0

INFANT LIFE	9547	125C, 7.0 VOLTS	48	HRS	303	0
OP-LIFE	9547	125C, 5.5 VOLTS	1000	HRS	116	1
INFANT LIFE	9602	125C, 7.0 VOLTS	48	HRS	304	0
OP-LIFE	9602	125C, 5.5 VOLTS	1000	HRS	116	0
HIGH VOLTAGE LIFE	9933	125C, 7.0 VOLTS	1000	HRS	116	0
				Total:		**2**

MOISTURE SENSITIVITY LEVEL 1

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
EXTERNAL VISUAL	0037	MIL-STD-883-2009			8	1
ULTRASOUND		J-STD-020			8	1
STORAGE LIFE		125C	24	HRS	8	
MOISTURE SOAK		85 C/85% R.H.	168	HRS	8	
CONVECTION REFLOW		235C	3	PASS	8	0
PRECONDITION U/S		J-STD-020			8	1
ULTRASOUND	9602	J-STD-020			8	0
MOISTURE SOAK		85 C/85% R.H.	170	HRS	8	
SOLDER HEAT		HTC VAPOR PHASE	3	PASS	8	
EXTERNAL VISUAL		MIL-STD-883-2009			8	0
PRECONDITION U/S		J-STD-020			8	0
				Total:		**3**

PACKAGE TESTS

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
SOLDERABILITY	0037	MIL-STD-883-2003			3	0
X-RAY	0037	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	9420	MIL-STD-883-2003			3	0
X-RAY	9420	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
CONSTRUCTION ANALY	9547	TO BE DONE BY F/A			5	0
				Total:		**0**

PRECONDITIONING

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
ULTRASOUND	9420	J-STD-020			5	0
				Total:		**0**

PRECONDITIONING LEVEL 1

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
STORAGE LIFE	0037	125C	24	HRS	315	
MOISTURE SOAK		85 C/85% R.H.	168	HRS	315	
CONVECTION REFLOW		235C	3	PASS	315	0
TEMP CYCLE	9420	-55C TO 125C	10	CYS	279	

MOISTURE SOAK	9420	85 C/85% R.H.	147	HRS	281	
SOLDER HEAT		HTC VAPOR PHASE	1	PASS	281	
MOISTURE SOAK	9602	85 C/85% R.H.	168	HRS	304	
SOLDER HEAT		HTC VAPOR PHASE	3	PASS	304	
				Total:		**0**

TEMPERATURE CYCLE

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
TEMP CYCLE	0037	-55C TO 125C	1000	CYS	74	0
TEMP CYCLE	9420	-55C TO 125C	1000	CYS	77	0
TEMP CYCLE	9547	-55C TO 125C	1000	CYS	77	0
TEMP CYCLE	9602	-55C TO 125C	1000	CYS	77	0
				Total:		**0**

TEMPERATURE HUMIDITY BIAS

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
BIASED MOISTURE	0037	85/85, 5.5 VOLTS	959	HRS	77	0
BIASED MOISTURE	9420	85/85, 5.5 VOLTS	959	HRS	77	0
HAST	9547	120C, 85%R.H.,5.5V	200	HRS	66	0
HAST	9602	120C, 85%R.H.,5.5V	200	HRS	66	0
				Total:		**0**

UNBIASED MOISTURE RESISTANCE

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
AUTOCLAVE	0037	121C, 2 ATM STEAM, UNBIASED	168	HRS	44	0
AUTOCLAVE	9420	121C, 2 ATM STEAM, UNBIASED	168	HRS	45	0
AUTOCLAVE	9547	121C, 2 ATM STEAM, UNBIASED	168	HRS	44	2
AUTOCLAVE	9602	121C, 2 ATM STEAM, UNBIASED	168	HRS	45	0
				Total:		**2**

FAILURE RATE: MTTF (YRS): 115454 FITS: 1.0