

RELIABILITY REPORT
FOR

DS21552, Rev B1

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:

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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): 70885** **FITS: 1.6**

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 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:

Process: D6H-2P2M,HPVt,Laser PBL:GOI
 Passivation: Laser/TEOS Ox - Pass/Nit - Gen.LaserPrb
 Die Size: 282 x 303
 Number of Transistors: 200000
 Interconnect: Aluminum / 1% Silicon / 0.5% Copper
 Gate Oxide Thickness: 150 Å

Assembly Information:

Assembly Site: ATK (Amkor, K)
 Pin Count: 100
 Package Type: LQFP
 Body Size: 14x14x1.4
 Mold Compound: Sumitomo 7320CR
 Lead Frame: EFTEC 64T w/Ag Spot
 Lead Finsh: SnPb Plate
 Die Attach: M2500 Ag Polymer
 Bond Wire / Size: Au / 1.2 mil
 Flammability: UL 94-V0
 Moisture Sensitivity Level 3
 (JEDEC J-STD20A)
 Date Code Range: 0106 to 0118

HIGH TEMPERATURE OPERATING LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
HIGH VOLTAGE LIFE	0106	125C, 6.0 VOLTS	192 HRS	77	0
HIGH VOLTAGE LIFE	0118	125C, 6.0 VOLTS	336 HRS	77	0
Total:					0

Assembly Information:

Assembly Site: ATP (Amkor, PI)
Pin Count: 100
Package Type: LQFP
Body Size: 14x14x1.4
Mold Compound: Sumitomo 7320CR
Lead Frame: EFTEC 64T w/Ag Spot
Lead Finsh: SnPb Plate
Die Attach: M2500 Ag Polymer
Bond Wire / Size: Au / 1.2 mil
Flammability: UL 94-V0
Moisture Sensitivity Level 3
(JEDEC J-STD20A)
Date Code Range: 0027 to 0227

CONSTRUCTION ANALYSIS

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
DIE, FAB PROCESS	0227	TO BE DONE BY F/A		3	0
				Total:	0

HIGH TEMPERATURE OPERATING LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
INFANT LIFE	0027	125C, 5.0 VOLTS	48 HRS	315	0
HIGH VOLTAGE LIFE	0027	125C, 5.0 VOLTS	1000 HRS	148	0
HIGH VOLTAGE LIFE	0145	125C, 6.0 VOLTS	240 HRS	77	0
HIGH VOLTAGE LIFE	0221	125C, 6.0 VOLTS	1000 HRS	77	0
HIGH VOLTAGE LIFE	0227	125C, 6.0 VOLTS	1000 HRS	77	0
HIGH VOLTAGE LIFE	0227	125C, 6.0 VOLTS	1000 HRS	77	0
				Total:	0

MOISTURE SENSITIVITY LEVEL 3

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
EXTERNAL VISUAL	0027	MIL-STD-883-2009		8	0
ULTRASOUND		J-STD-020		8	0
STORAGE LIFE		125C	24 HRS	8	
MOISTURE SOAK		30C/60% R.H.	240 HRS	8	
CONVECTION REFLOW		235C	3 PASS	8	0
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	0027	MIL-STD-883-2003		3	0
X-RAY	0027	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

PIN HOLE TEST	0227	MIL-STD-833-2021			5	0
					Total:	0

PRECONDITIONING LEVEL 3

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS	
STORAGE LIFE	0027	125C	24 HRS	317		
MOISTURE SOAK		30C/60% R.H.	240 HRS	317		
CONVECTION REFLOW		235C	3 PASS	317	0	
					Total:	0

TEMPERATURE CYCLE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS	
TEMP CYCLE	0027	-55C TO 125C	1000 CYS	76	0	
TEMP CYCLE	0227	-55C TO 125C	1000 CYS	77	0	
TEMP CYCLE	0227	-55C TO 125C	1000 CYS	77	0	
					Total:	0

UNBIASED MOISTURE RESISTANCE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS	
HAST, NO BIAS	0027	130C, 85% R.H.	200 HRS	90	0	
AUTOCLAVE	0227	121C, 2 ATM STEAM, UNBIASED	168 HRS	77	0	
AUTOCLAVE	0227	121C, 2 ATM STEAM, UNBIASED	168 HRS	77	0	
					Total:	0

Assembly Information:

Assembly Site: Stats
 Pin Count: 100
 Package Type: LQFP
 Body Size: 14x14x1.4
 Mold Compound: Sumitomo 7320CR
 Lead Frame: Stamped Copper C7025
 Lead Finsh: SnPb Plate
 Die Attach: 84-1 LMISR4 Epoxy Silverfilled Ablebond
 Bond Wire / Size: Au / 1.2 mil
 Flammability: UL 94-V0
 Moisture Sensitivity (JEDEC J-STD20A) Level 3
 Date Code Range: 0047 to 0145

ELECTRICAL CHARACTERIZATION

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
ESD SENSITIVITY	0145	EOS/ESD S5.1 HBM 500 VOLTS	2 PUL'S	3	0
ESD SENSITIVITY	0145	EOS/ESD S5.1 HBM 1000 VOLTS	2 PUL'S	3	0
ESD SENSITIVITY	0145	EOS/ESD S5.1 HBM 2000 VOLTS	2 PUL'S	3	0
ESD SENSITIVITY	0145	EOS/ESD S5.1 HBM 4000 VOLTS	2 PUL'S	3	2
ESD SENSITIVITY	0145	EOS/ESD S5.1 HBM 8000 VOLTS	2 PUL'S	3	3
LATCH-UP	0145	JESD78, I-TEST 125C		3	0
LATCH-UP	0145	JESD78, Vsupply TEST 125C		3	0

Total: 5

HIGH TEMPERATURE OPERATING LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QUANTITY	FAILS
HIGH VOLTAGE LIFE	0047	125C, 6.0 VOLTS	1000 HRS	150	0
			Total:		0

FAILURE RATE: **MTTF (YRS): 70885** **FITS: 1.6**