

RELIABILITY REPORT
FOR

DS32KHZ 0.8um Fab Process 6" to 8" Conversion

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:

DS32KHZ 0.8um Fab Process 6" to 8" Conversion

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):	37928	FITS:	3.0
	DEVICE HOURS:	322784	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
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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:	DS1232
Process:	E8S-1P1M, HPVt, N+ESD, ALOCOS:GOI 5" Reticles
Passivation:	Passivation w/Nov TEOS Oxide-Nitride
Die Size:	78 x 50
Number of Transistors:	1150
Interconnect:	Aluminum / 1% Silicon / 0.5% Copper
Gate Oxide Thickness:	

Assembly Information:

Qualification Vehicle:	DS1232
Assembly Site:	Unisem
Pin Count:	8
Package Type:	SOIC (Pb-Free)
Body Size:	150x1.4
Mold Compound:	Sumitomo 6730B
Lead Frame:	Stamped Copper CDA194
Lead Finsh:	Sn Plate 100% Matte (With Anneal Bake)
Die Attach:	84-1 LMISR4 Epoxy Silverfilled Ablebond
Bond Wire / Size:	Au / 1.0 mil
Theta JA:	170
Theta JC:	40
Flammability:	UL 94-V0
Moisture Sensitivity (JEDEC J-STD20A)	Level 1
Date Code Range:	0628 to 0628

ELECTRICAL CHARACTERIZATION

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QTY	FAILS	FA#
ESD SENSITIVITY	0628	EOS/ESD S5.1 HBM 500 VOLTS	1 PUL'S	3	0	

ESD SENSITIVITY	0628	EOS/ESD S5.1 HBM 1000 VOLTS	1	PUL'S	3	0	
ESD SENSITIVITY	0628	EOS/ESD S5.1 HBM 2000 VOLTS	1	PUL'S	3	0	
ESD SENSITIVITY	0628	EOS/ESD S5.1 HBM 4000 VOLTS	1	PUL'S	3	0	
ESD SENSITIVITY	0628	EOS/ESD S5.1 HBM 8000 VOLTS	1	PUL'S	3	3	No FA
LATCH-UP	0628	JESD78, I-TEST 125C			6	0	
LATCH-UP	0628	JESD78, V-SUPPLY TEST 125C			6	0	
Total:						3	

OPERATING LIFE

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
HIGH TEMP OP LIFE	0628		125C, 5.5 VOLTS	1000 HRS	77	0	
Total:						0	

PRECONDITIONING LEVEL 1

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
STORAGE LIFE	0628		125C	48 HRS	231		
MOISTURE SOAK			85 C/85% R.H.	168 HRS	231		
CONVECTION REFLOW			260C +/-5C	3 PASS	231	0	
Total:						0	

TEMPERATURE CYCLE

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
TEMP CYCLE	0628		-55C TO 125C	1000 CYS	77	0	
Total:						0	

TEMPERATURE HUMIDITY BIAS

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
HAST	0628		130C, 85%R.H.,5.5V	96 HRS	77	0	
Total:						0	

UNBIASED MOISTURE RESISTANCE

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
AUTOCLAVE	0628		121C, 2 ATM STEAM, UNBIASED	168 HRS	75	0	
Total:						0	

Device Information:

Device: DS1302
 Process: EC8H - 1P2M, MP Vts, PD-ESD, PF-Ring ALOCOS:GOI 5"
 Passivation: Passivation w/Nov TEOS Oxide-Nitride
 Die Size: 75 x 75
 Number of Transistors: 9752
 Interconnect: Aluminum / 1% Silicon / 0.5% Copper
 Gate Oxide Thickness:

Assembly Information:

Qualification Vehicle: DS1302
Assembly Site: UTL (NSEB) UTAC Thailand
Pin Count: 8
Package Type: PDIP (Pb-Free)
Body Size: 300
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 / 1.3 mil
Theta JA: 110
Theta JC: 40
Flammability: UL 94-V0
Moisture Sensitivity (JEDEC J-STD20A) NA
Date Code Range: 0636 to 0636

ELECTRICAL CHARACTERIZATION

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QTY	FAILS	FA#
ESD SENSITIVITY	0636	EOS/ESD S5.1 HBM 500 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0636	EOS/ESD S5.1 HBM 1000 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0636	EOS/ESD S5.1 HBM 2000 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0636	EOS/ESD S5.1 HBM 4000 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0636	EOS/ESD S5.1 HBM 8000 VOLTS	1 PUL'S	3	0	
LATCH-UP	0636	JESD78, I-TEST 125C		6	0	
LATCH-UP	0636	JESD78, V-SUPPLY TEST 125C		6	0	
Total:					0	

OPERATING LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QTY	FAILS	FA#
HIGH TEMP OP LIFE	0636	125C, 5.5 VOLTS	1000 HRS	77	0	
Total:					0	

TEMPERATURE CYCLE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QTY	FAILS	FA#
TEMP CYCLE	0636	-55C TO 125C	1000 CYS	77	0	
Total:					0	

TEMPERATURE HUMIDITY BIAS

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QTY	FAILS	FA#
BIASED MOISTURE	0636	85/85, 5.5 VOLTS	1000 HRS	77	0	
Total:					0	

UNBIASED MOISTURE RESISTANCE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QTY	FAILS	FA#
AUTOCLAVE	0636	121C, 2 ATM STEAM, UNBIASED	168 HRS	77	0	
Total:					0	

Device Information:

Device: DS2430
Process: EC8X-1P2M, E2, DSDw/LVWells,PF-Ring, ALOCOS:GOI 5"
Passivation: NRL Laser w/Nov TEOS Oxide-Nitride
Die Size: 96 x 70
Number of Transistors: 9708
Interconnect: Aluminum / 1% Silicon / 0.5% Copper
Gate Oxide Thickness:

Assembly Information:

Qualification Vehicle: DS2430
Assembly Site: Hana
Pin Count: 3
Package Type: TO92 (Pb-Free)
Body Size: 150
Mold Compound: Sumitomo 6710S
Lead Frame: Stamped Copper CDA194
Lead Finish: Sn Plate 100% Matte (With Anneal Bake)
Die Attach: 84-1 LMISR4 Epoxy Silverfilled Ablebond
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: 0637 to 0637

ELECTRICAL CHARACTERIZATION

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
ESD SENSITIVITY	0637		EOS/ESD S5.1 HBM 500 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0637		EOS/ESD S5.1 HBM 1000 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0637		EOS/ESD S5.1 HBM 2000 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0637		EOS/ESD S5.1 HBM 4000 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0637		EOS/ESD S5.1 HBM 8000 VOLTS	1 PUL'S	3	0	
ESD SENSITIVITY	0637		IEC 61000-4-2 CONTACT 2000 VOLTS	10 PUL'S	3	0	
ESD SENSITIVITY	0637		IEC 61000-4-2 CONTACT 4000 VOLTS	10 PUL'S	3	0	
ESD SENSITIVITY	0637		IEC 61000-4-2 CONTACT 6000 VOLTS	10 PUL'S	3	0	
ESD SENSITIVITY	0637		IEC 61000-4-2 CONTACT 8000 VOLTS	10 PUL'S	3	0	
ESD SENSITIVITY	0637		IEC 61000-4-2 AIR 2000 VOLTS	10 PUL'S	3	0	
ESD SENSITIVITY	0637		IEC 61000-4-2 AIR 4000 VOLTS	10 PUL'S	3	0	
ESD SENSITIVITY	0637		IEC 61000-4-2 AIR 8000 VOLTS	10 PUL'S	3	0	
ESD SENSITIVITY	0637		IEC 61000-4-2 AIR 15000 VOLTS	10 PUL'S	3	1	No FA
LATCH-UP	0637		JESD78, V-SUPPLY TEST 125C		6	0	
						Total:	1

OPERATING LIFE

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
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HIGH TEMP OP LIFE	0637	125C, 6.0 VOLTS	1000 HRS	77	0
			Total:		0

TEMPERATURE CYCLE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QTY	FAILS	FA#
TEMP CYCLE	0637	-55C TO 125C	1000 CYS	77	0	
			Total:		0	

TEMPERATURE HUMIDITY BIAS

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QTY	FAILS	FA#
BIASED MOISTURE	0637	85/85, 5.5 VOLTS	1000 HRS	77	0	
			Total:		0	

UNBIASED MOISTURE RESISTANCE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QTY	FAILS	FA#
AUTOCLAVE	0637	121C, 2 ATM STEAM, UNBIASED	168 HRS	77	0	
			Total:		0	

W/E ENDURANCE AND DATA RET'N

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QTY	FAILS	FA#
WRITE CYCLE STRESS (KCYS)	0637	25 C, 5.0 VOLTS	100 KCYS	77	0	
STORAGE LIFE		150C	1000 HRS	77	0	
			Total:		0	

Device Information:

Device: DS32KHZS
 Process: EC8E - 2P2M, EPROM, Nd&PdDSD, LowVts, NoThkGox, 5"
 Passivation: Passivation w/Nov TEOS Oxide-OxyNitride
 Die Size: 142 x 82
 Number of Transistors: 27219
 Interconnect: Aluminum / 1% Silicon / 0.5% Copper
 Gate Oxide Thickness:

Assembly Information:

Qualification Vehicle: DS32KHZS
 Assembly Site: CIRTEK
 Pin Count: 16
 Package Type: SOIC Welded Crystal (RoHS)
 Body Size: 300x2.3
 Mold Compound: Sumitomo G600
 Lead Frame: Etched Copper CDA194
 Lead Finish: Sn Plate 100% Matte (With Anneal Bake)
 Die Attach: 84-1 LMISR4 Epoxy Silverfilled Ablebond
 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: 0633 to 0633

ELECTRICAL CHARACTERIZATION

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QTY	FAILS	FA#
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ESD SENSITIVITY	0633	EOS/ESD S5.1 HBM 500 VOLTS	1	PUL'S	3	0	
ESD SENSITIVITY	0633	EOS/ESD S5.1 HBM 1000 VOLTS	1	PUL'S	3	0	
ESD SENSITIVITY	0633	EOS/ESD S5.1 HBM 2000 VOLTS	1	PUL'S	3	0	
ESD SENSITIVITY	0633	EOS/ESD S5.1 HBM 4000 VOLTS	1	PUL'S	3	2	No FA
ESD SENSITIVITY	0633	EOS/ESD S5.1 HBM 8000 VOLTS	1	PUL'S	3	3	No FA
LATCH-UP	0633	JESD78, I-TEST 125C			6	0	
LATCH-UP	0633	JESD78, V-SUPPLY TEST 125C			6	0	
Total:						5	

OPERATING LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QTY	FAILS	FA#
HIGH TEMP OP LIFE	0633	125C, 5.5 VOLTS	1000 HRS	77	0	
Total:					0	

PRECONDITIONING LEVEL 1

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QTY	FAILS	FA#
STORAGE LIFE	0633	125C	24 HRS	231		
MOISTURE SOAK		85 C/85% R.H.	168 HRS	231		
CONVECTION REFLOW		260C +/-5C	2 PASS	231	0	
Total:					0	

STORAGE LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QTY	FAILS	FA#
STORAGE LIFE	0633	125C	1000 HRS	77	0	
Total:					0	

TEMPERATURE CYCLE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QTY	FAILS	FA#
TEMP CYCLE	0633	-40 TO 85C	1000 CYS	77	0	
Total:					0	

TEMPERATURE HUMIDITY BIAS

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QTY	FAILS	FA#
BIASED MOISTURE	0633	85/85, 5.5 VOLTS	1000 HRS	77	0	
Total:					0	

UNBIASED MOISTURE RESISTANCE

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QTY	FAILS	FA#
AUTOCLAVE	0633	121C, 2 ATM STEAM, UNBIASED	168 HRS	77	0	
Total:					0	

Device Information:

Device: DS87C520
 Process: EC8M - 2P1M, ThnEP/Si,ThnOx NdPdDSD,N+ESD, 5" Reti
 Passivation: Passivation w/Nov TEOS Oxide
 Die Size: 261 x 274
 Number of Transistors: 276610
 Interconnect: Aluminum / 1% Silicon / 0.5% Copper
 Gate Oxide Thickness:

