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RELIABILITY REPORT
FOR

DS21Q42 & DS21Q44

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:

DS21Q42 & DS21Q44

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): 71407 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: 3 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:	DS21Q44
Process:	1P, 2M,0.35um, Sil.P1, Ti/TiN M1-M2 ,BPSG,Masked N+ES
Passivation:	Passivation w/Nov TEOS Oxide-Nitride
Die Size:	288 x 286
Number of Transistors:	
Interconnect:	Aluminum / 1% Silicon / 0.5% Copper
Gate Oxide Thickness:	75 Å

Assembly Information:

Qualification Vehicle:	DS21Q44
Assembly Site:	ATK (Amkor, K)
Pin Count:	128
Package Type:	LQFP
Body Size:	14x20x1.4
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 (JEDEC J-STD20A)	Level 3
Date Code Range:	9838 to 9838

HIGH TEMPERATURE OPERATING LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
INFANT LIFE	9838	125C, 3.5 VOLTS (PSA)	48	HOURS	352	0
HIGH VOLTAGE LIFE	9838	125C, 3.5 VOLTS (PSA)	2000	HOURS	200	0
				Total:		**0**

LOW TEMPERATURE OPERATING LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
BIASED BAKE	9838	-20C, 3.5 VOLTS	1000	HOURS	77	0
				Total:		**0**

MOISTURE SENSITIVITY LEVEL 3

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
ULTRASOUND	9838	J-STD-020			8	0
STORAGE LIFE		125C	26	HOURS	8	
MOISTURE SOAK		30C/60% R.H.	240	HOURS	8	
CONVECTION REFLOW		235C	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	9838	TO BE DONE BY F/A			5	0
				Total:		**0**

TEMPERATURE CYCLE

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
TEMP CYCLE	9838	-55C TO 125C	1000	CYCLES	75	0
				Total:		**0**

Assembly Information:

Qualification Vehicle:	DS21Q44
Assembly Site:	Stats
Pin Count:	128
Package Type:	LQFP
Body Size:	14x20x1.4
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:	9936 to 0047

HIGH TEMPERATURE OPERATING LIFE

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
HIGH VOLTAGE LIFE	0047	125C, 3.5 VOLTS	1000	HOURS	116	0
INFANT LIFE	9936	125C, 3.5 VOLTS	48	HOURS	100	0
HIGH VOLTAGE LIFE	9936	125C, 3.5 VOLTS	1000	HOURS	70	0
				Total:		**0**

MOISTURE SENSITIVITY LEVEL 3

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
EXTERNAL VISUAL	9936	MIL-STD-883-2009			8	0

ULTRASOUND	9936	J-STD-020			8	0
STORAGE LIFE		125C	24	HOURS	6	
MOISTURE SOAK		30C/60% R.H.	240	HOURS	6	
CONVECTION REFLOW		235C	3	PASS	6	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	9936	MIL-STD-883-2003			3	0
X-RAY	9936	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 3

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
STORAGE LIFE	9936	125C	24	HOURS	286	
MOISTURE SOAK		30C/60% R.H.	240	HOURS	286	
CONVECTION REFLOW		235C	3	PASS	286	0
				Total:		**0**

TEMPERATURE CYCLE

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
TEMP CYCLE	9936	-55C TO 125C	1000	CYCLES	77	0
				Total:		**0**

TEMPERATURE HUMIDITY BIAS

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
BIASED MOISTURE	9936	85/85, 3.5 VOLTS	959	HOURS	48	0
				Total:		**0**

UNBIASED MOISTURE RESISTANCE

DESCRIPTION	DATE CODE	CONDITION	READPOINT		QUANTITY	FAILS
HAST, NO BIAS	9936	130C, 85% R.H.	200	HOURS	45	0
				Total:		**0**

FAILURE RATE: **MTTF (YRS): 71407** **FITS: 1.6**