

**PACKAGE RELIABILITY REPORT  
FOR**

**32 TSOP 8mm**

**Dallas Semiconductor**

**4401 South Beltwood Parkway  
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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 packages:

32 TSOP 8mm

In addition, Dallas Semiconductor's continuous reliability monitor program ensures that all outgoing assemblies 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>.

**Package Description:**

A description of this assembly can be found in the product data sheet. You can find the product data sheet at [http://dbserv.maxim-ic.com/l\\_datasheet3.cfm](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<sup>-5</sup> 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): 37651**                      **FITS: 3.0**

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. Some of the data in this report may be generic. At the start of this data is 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. Where appropriate, preconditioning is performed before all stresses and the bond crater test unless otherwise noted. The reliability data section includes the latest data available.

**Assembly Information:**

Assembly Site: ASE  
 Pin Count: 28  
 Package Type: TSOP  
 Body Size: 8x13.4x0.965  
 Mold Compound: Sumitomo G700  
 Lead Frame: Stamped Alloy 42  
 Lead Finsh: Sn Plate 100% Matte  
 Die Attach: Sumitomo 1076 DS  
 Bond Wire / Size: Au / 1.0 mil  
 Flammability: UL 94-V0  
 Theta JA:  
 Theta JC:  
 Moisture Sensitivity (JEDEC J-STD20A) Level 3  
 Date Code Range: 0429 to 0429

**PACKAGE TESTS**

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QTY	FAILS	FA#
SOLDERABILITY	0429	JESD22-B102		15	0	
<b>Total:</b>					<b>0</b>	

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**Assembly Information:**

Assembly Site: ATK (Amkor, K)  
Pin Count: 28  
Package Type: TSOP  
Body Size: 8x13.4x0.965  
Mold Compound: Sumitomo 7351T  
Lead Frame: Stamped Copper C7025  
Lead Finsh: SnPb Plate  
Die Attach: 8361J Epoxy Silverfilled Ablebond  
Bond Wire / Size: Au / 1.0 mil  
Flammability: UL 94-V0  
Theta JA:  
Theta JC:  
Moisture Sensitivity (JEDEC J-STD20A) Level 3  
Date Code Range: 0223 to 0303

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**OPERATING LIFE**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
HIGH VOLTAGE LIFE	0223		125C, 7.0 VOLTS	1000 HRS	80	0	
HIGH VOLTAGE LIFE	0223		125C, 7.0 VOLTS	1000 HRS	160	0	
HIGH VOLTAGE LIFE	0303		125C, 6.0 VOLTS	1000 HRS	77	0	
<b>Total:</b>						<b>0</b>	

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**Assembly Information:**

Assembly Site: ATK (Amkor, K)  
Pin Count: 32  
Package Type: TSOP  
Body Size: 8x20x1.0  
Mold Compound: Sumitomo 7351T  
Lead Frame: Stamped Copper C7025  
Lead Finsh: SnPb Plate  
Die Attach: 8361J Epoxy Silverfilled Ablebond  
Bond Wire / Size: Au / 1.0 mil  
Flammability: UL 94-V0  
Theta JA:  
Theta JC:  
Moisture Sensitivity (JEDEC J-STD20A) Level 3  
Date Code Range: 0038 to 0303

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**MOISTURE SENSITIVITY LEVEL 3**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
ULTRASOUND	0038		J-STD-020		8	0	
STORAGE LIFE			125C	24 HRS	8		
MOISTURE SOAK			30C/60% R.H.	240 HRS	8		
CONVECTION REFLOW			235C +5/-0C	3 PASS	8	0	
EXTERNAL VISUAL			MIL-STD-883-2009		8	0	
PRECONDITION U/S			J-STD-020		8	0	
<b>Total:</b>						<b>0</b>	

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**OPERATING LIFE**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
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HIGH VOLTAGE LIFE	0038	125C, 6.0 VOLTS	1000 HRS	116	0
HIGH VOLTAGE LIFE	0303	125C, 6.0 VOLTS	1000 HRS	77	0
<b>Total:</b>				<b>0</b>	<b>0</b>

### PACKAGE TESTS

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
SOLDERABILITY	0038		MIL-STD-883-2003		3	0	
X-RAY	0038		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	
<b>Total:</b>					<b>0</b>	<b>0</b>	

### PRECONDITIONING LEVEL 3

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
STORAGE LIFE	0038		125C	24 HRS	315		
MOISTURE SOAK			30C/60% R.H.	240 HRS	315		
CONVECTION REFLOW			235C +5/-0C	3 PASS	315	0	
<b>Total:</b>					<b>0</b>	<b>0</b>	

### TEMPERATURE CYCLE

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
TEMP CYCLE	0038		-55C TO 125C	1000 CYS	77	0	
<b>Total:</b>					<b>0</b>	<b>0</b>	

### TEMPERATURE HUMIDITY BIAS

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
HAST	0038		130C, 85%R.H.,5.5V	100 HRS	77	0	
<b>Total:</b>					<b>0</b>	<b>0</b>	

### UNBIASED MOISTURE RESISTANCE

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
HAST, NO BIAS	0038		130C, 85% R.H.	200 HRS	45	0	
<b>Total:</b>					<b>0</b>	<b>0</b>	

### Assembly Information:

Assembly Site: ATP (Amkor, PI)  
 Pin Count: 28  
 Package Type: TSOP  
 Body Size: 8x13.4x0.965  
 Mold Compound: Sumitomo 7351T  
 Lead Frame: Stamped Copper C7025  
 Lead Finsh: SnPb Plate  
 Die Attach: 8361J Epoxy Silverfilled Ablebond  
 Bond Wire / Size: Au / 1.0 mil  
 Flammability: UL 94-V0  
 Theta JA:  
 Theta JC:  
 Moisture Sensitivity (JEDEC J-STD20A) Level 3  
 Date Code Range: 9921 to 9924

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**MOISTURE SENSITIVITY LEVEL 3**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
PRECONDITION U/S	9921		J-STD-020		6	0	
EXTERNAL VISUAL			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 +5/-0C	3 PASS	8	0	
PRECONDITION U/S	9921		J-STD-020		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 +5/-0C	3 PASS	8	0	
EXTERNAL VISUAL			MIL-STD-883-2009		8	0	
<b>Total:</b>						<b>0</b>	

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**OPERATING LIFE**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
HIGH VOLTAGE LIFE	9921		125C, 7.0 VOLTS	1000 HRS	116	0	
HIGH VOLTAGE LIFE	9924		125C, 7.0 VOLTS	1000 HRS	116	1	990165
<b>Total:</b>						<b>1</b>	

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**PACKAGE TESTS**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
CONSTRUCTION ANALYSIS	9921		SENT TO OUTSIDE SOURCE		5	0	
SOLDERABILITY	9921		MIL-STD-883-2003		3	0	
X-RAY	9921		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	9921		MIL-STD-883-2003		3	0	
X-RAY	9921		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	
<b>Total:</b>						<b>0</b>	

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**PRECONDITIONING LEVEL 3**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
STORAGE LIFE	9921		125C	24 HRS	356		
MOISTURE SOAK			30C/60% R.H.	240 HRS	356		
CONVECTION REFLOW			235C +5/-0C	3 PASS	356	0	
<b>Total:</b>						<b>0</b>	

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**TEMPERATURE CYCLE**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
TEMP CYCLE	9921		-55C TO 125C	1000 CYS	77	0	
TEMP CYCLE	9921		-55C TO 125C	1000 CYS	91	0	

**Total: 0**

**TEMPERATURE HUMIDITY BIAS**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
HAST	9921		130C, 85%R.H.,5.5V	100 HRS	45	1	No FA
HAST	9921		130C, 85%R.H.,5.5V	100 HRS	90	0	
<b>Total:</b>						<b>1</b>	

**UNBIASED MOISTURE RESISTANCE**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
HAST, NO BIAS	9921		130C, 85% R.H.	200 HRS	45	0	
HAST, NO BIAS	9921		130C, 85% R.H.	200 HRS	55	0	
<b>Total:</b>						<b>0</b>	

**Assembly Information:**

Assembly Site: ATP (Amkor, PI)  
Pin Count: 32  
Package Type: TSOP  
Body Size: 8x20x1.0  
Mold Compound: Sumitomo 7351T  
Lead Frame: Stamped Copper C7025  
Lead Finsh: SnPb Plate  
Die Attach: 8361J Epoxy Silverfilled Ablebond  
Bond Wire / Size: Au / 1.0 mil  
Flammability: UL 94-V0  
Theta JA:  
Theta JC:  
Moisture Sensitivity (JEDEC J-STD20A) Level 3  
Date Code Range: 9913 to 0106

**MOISTURE SENSITIVITY LEVEL 3**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
PRECONDITION U/S	9913		J-STD-020		8	0	
ULTRASOUND			J-STD-020		8	0	
STORAGE LIFE			125C	HRS	8		
MOISTURE SOAK			30C/60% R.H.	240 HRS	8		
CONVECTION REFLOW			235C +5/-0C	3 PASS	8	0	
EXTERNAL VISUAL			MIL-STD-883-2009		8	0	
<b>Total:</b>						<b>0</b>	

**OPERATING LIFE**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
HIGH VOLTAGE LIFE	9913		125C, 6.0 VOLTS	1000 HRS	85	0	
HIGH VOLTAGE LIFE	0106		125C, 6.0 VOLTS	1000 HRS	256	2	iBATT LEAK
<b>Total:</b>						<b>2</b>	

**PACKAGE TESTS**

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
SOLDERABILITY	9913		MIL-STD-883-2003		3	0	
X-RAY	9913		MIL-STD-883-2012 : TOP & SIDE VIEW		6	0	

PHYSICAL DIMENSIONS	9913	MIL-STD-883-2016	6	0
MARK PERMANENCY		MIL-STD-883-2015	6	0
LEAD INTEGRITY		MIL-STD-883-2004 : COND B2	6	0
<b>Total:</b>			<b>0</b>	<b>0</b>

### PRECONDITIONING LEVEL 3

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
STORAGE LIFE	9913		125C	24 HRS	315		
MOISTURE SOAK			30C/60% R.H.	240 HRS	315		
CONVECTION REFLOW			235C +5/-0C	3 PASS	315	0	
<b>Total:</b>						<b>0</b>	

### TEMPERATURE CYCLE

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
TEMP CYCLE	9913		-55C TO 125C	1000 CYS	70	0	
<b>Total:</b>						<b>0</b>	

### TEMPERATURE HUMIDITY BIAS

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
HAST	9913		130C, 85%R.H.,5.5V	100 HRS	70	0	
<b>Total:</b>						<b>0</b>	

### UNBIASED MOISTURE RESISTANCE

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
HAST, NO BIAS	9913		130C, 85% R.H.	200 HRS	40	0	
<b>Total:</b>						<b>0</b>	

### Assembly Information:

Assembly Site: NSEB  
 Pin Count: 28  
 Package Type: TSOP  
 Body Size: 8x13.4x0.965  
 Mold Compound: Ciba-Geigy Aratonic 2184-4 (KMC 184)  
 Lead Frame: Stamped Copper C7025  
 Lead Finsh: SnPb Plate  
 Die Attach: 84-1 LMISR4 Epoxy Silverfilled Ablebond  
 Bond Wire / Size: Au / 1.0 mil  
 Flammability: UL 94-V0  
 Theta JA:  
 Theta JC:  
 Moisture Sensitivity (JEDEC J-STD20A) Level 3  
 Date Code Range: 0432 to 0432

### PACKAGE TESTS

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
SOLDERABILITY	0432		JESD22-B102		8	0	
<b>Total:</b>						<b>0</b>	



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**Assembly Information:**

Assembly Site: NSEB  
Pin Count: 32  
Package Type: TSOP  
Body Size: 8x20x1.0  
Mold Compound: Ciba-Geigy Aratonic 2184-4 (KMC 184)  
Lead Frame: Stamped Copper C7025  
Lead Finsh: SnPb Plate  
Die Attach: 84-1 LMISR4 Epoxy Silverfilled Ablebond  
Bond Wire / Size: Au / 1.0 mil  
Flammability: UL 94-V0  
Theta JA:  
Theta JC:  
Moisture Sensitivity (JEDEC J-STD20A) Level 3  
Date Code Range: 0145 to 0324

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**CONSTRUCTION ANALYSIS**

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QTY	FAILS	FA#
CONSTRUCTION ANALYSIS	0146	TO BE SUBMITTED BY ASSEMBLY SITE		3	0	
<b>Total:</b>					<b>0</b>	

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**MOISTURE SENSITIVITY LEVEL 3**

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QTY	FAILS	FA#
ULTRASOUND	0145	J-STD-020		8	0	
STORAGE LIFE		125C	24 HRS	8		
MOISTURE SOAK		30C/60% R.H.	192 HRS	8		
CONVECTION REFLOW		235C +5/-0C	3 PASS	8	0	
EXTERNAL VISUAL		J-STD-020, 6.1a		8	0	
PRECONDITION U/S		J-STD-020		8	0	
ULTRASOUND	0146	J-STD-020		8	0	
STORAGE LIFE		125C	24 HRS	8		
MOISTURE SOAK		30C/60% R.H.	192 HRS	8		
CONVECTION REFLOW		235C +5/-0C	3 PASS	8	0	
EXTERNAL VISUAL		J-STD-020, 6.1a		8	0	
PRECONDITION U/S		J-STD-020		8	0	
ULTRASOUND	0147	J-STD-020		8	0	
STORAGE LIFE		125C	24 HRS	8		
MOISTURE SOAK		30C/60% R.H.	192 HRS	8		
CONVECTION REFLOW		235C +5/-0C	3 PASS	8	0	
EXTERNAL VISUAL		J-STD-020, 6.1a		8	0	
PRECONDITION U/S		J-STD-020		8	0	
<b>Total:</b>					<b>0</b>	

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**OPERATING LIFE**

DESCRIPTION	DATE CODE	CONDITION	READPOINT	QTY	FAILS	FA#
HIGH VOLTAGE LIFE	0145	125C, 6.0 VOLTS	1000 HRS	70	0	
HIGH VOLTAGE LIFE	0146	125C, 6.0 VOLTS	1000 HRS	77	0	
HIGH VOLTAGE LIFE	0147	125C, 6.0 VOLTS	1000 HRS	77	0	
HIGH TEMP OP LIFE	0324	125C, 5.5 VOLTS	1000 HRS	77	0	

HIGH TEMP OP LIFE	0324	125C, 5.5 VOLTS	988	HRS	77	0
					<b>Total:</b>	<b>0</b>

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### PACKAGE TESTS

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
SOLDERABILITY	0145		JESD22-B102		3	0	
X-RAY	0145		MIL-STD-883-2012 : TOP & SIDE VIEW		6	0	
PHYSICAL DIMENSIONS			JESD22-B100		6	0	
MARK PERMANENCY			JESD22-B107		6	0	
LEAD INTEGRITY			JESD22-B105 TEST CONDITION B		6	0	
SOLDERABILITY	0146		JESD22-B102		3	0	
X-RAY	0146		MIL-STD-883-2012 : TOP & SIDE VIEW		6	0	
PHYSICAL DIMENSIONS			JESD22-B100		6	0	
MARK PERMANENCY			JESD22-B107		6	0	
LEAD INTEGRITY			JESD22-B105 TEST CONDITION B		6	0	
SOLDERABILITY	0147		JESD22-B102		3	0	
X-RAY	0147		MIL-STD-883-2012 : TOP & SIDE VIEW		6	0	
PHYSICAL DIMENSIONS			JESD22-B100		6	0	
MARK PERMANENCY			JESD22-B107		6	0	
LEAD INTEGRITY			JESD22-B105 TEST CONDITION B		6	0	
					<b>Total:</b>	<b>0</b>	

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### PRECONDITIONING LEVEL 3

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
STORAGE LIFE	0145		125C	24 HRS	308		
MOISTURE SOAK			30C/60% R.H.	192 HRS	308		
CONVECTION REFLOW			235C +5/-0C	3 PASS	308	0	
STORAGE LIFE	0146		125C	24 HRS	308		
MOISTURE SOAK			30C/60% R.H.	192 HRS	308		
CONVECTION REFLOW			235C +5/-0C	3 PASS	308	0	
STORAGE LIFE	0147		125C	24 HRS	308		
MOISTURE SOAK			30C/60% R.H.	192 HRS	308		
CONVECTION REFLOW			235C +5/-0C	3 PASS	308	0	
					<b>Total:</b>	<b>0</b>	

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### TEMPERATURE CYCLE

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
TEMP CYCLE	0145		-55C TO 125C	1000 CYS	70	0	
TEMP CYCLE	0146		-55C TO 125C	1000 CYS	77	0	
TEMP CYCLE	0147		-55C TO 125C	1000 CYS	77	0	
					<b>Total:</b>	<b>0</b>	

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### TEMPERATURE HUMIDITY BIAS

DESCRIPTION	DATE	CODE	CONDITION	READPOINT	QTY	FAILS	FA#
HAST	0145		130C, 85%R.H.,5.5V	100 HRS	44	0	
HAST	0146		130C, 85%R.H.,5.5V	100 HRS	77	0	
HAST	0147		130C, 85%R.H.,5.5V	100 HRS	77	0	

**Total: 0**

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**UNBIASED MOISTURE RESISTANCE**

<b>DESCRIPTION</b>	<b>DATE</b>	<b>CODE</b>	<b>CONDITION</b>	<b>READPOINT</b>	<b>QTY</b>	<b>FAILS</b>	<b>FA#</b>
HAST, NO BIAS	0145		130C, 85% R.H.	200 HRS	44	0	
HAST, NO BIAS	0146		130C, 85% R.H.	200 HRS	74	0	
HAST, NO BIAS	0147		130C, 85% R.H.	200 HRS	73	0	
				<b>Total:</b>		<b>0</b>	

**FAILURE RATE: MTTF (YRS): 37651 FITS: 3.0**