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Surface-Mount Devices Reliability Report

This report presents reliability data for Maxim's surface-mount devices, including the results of extensive reliability stress tests performed solely on epoxy surface-mount packages since 1995.

Maxim's surface-mount packages are subjected to standard reliability tests typically applied to epoxy DIP packages, as well as to a series of stringent solder reflow tests that simulate the worst-case PC board assembly. These reliability tests conform to the JEDEC Standard No. 22 Test Method and Procedures for Solid-State Devices.

For surface-mount packages, Maxim uses state-of-the-art packaging materials and processing methods that substantially reduce die surface stress and provide superior moisture resistance. Maxim's surface-mount packages exhibit no degradation after moisture resistance tests or solder reflow simulation, nor do they show any compromise in other reliability performance.



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Introduction

Maxim Integrated Products designs, develops, manufactures, and markets linear and mixed-signal integrated circuits. Products include data converters, interface circuits, microprocessor supervisors, operational amplifiers, power supplies, multiplexers, switches, battery chargers, battery management circuits, RF circuits, fiber optic transceivers, sensors, and voltage references. Maxim Integrated Products is a global company with manufacturing facilities in the United States, testing facilities in the Philippines, and sales offices throughout the world. The company's products are sold to customers in numerous markets, including data processing, telecommunications, networking, industrial control, instrumentation, and military markets.

Maxim offers each product in various package types, including plastic surface-mount packages. These surface-mount packages are processed through the same manufacturing flow as our plastic dual-in-line (DIP) devices, and are tested to the same stringent electrical standard of 100% data-sheet parameters and visual AQL (acceptable quality limit) levels.

Maxim has taken a leading-edge position by developing a unique surface-mount packaging system unequalled in product performance and reliability, despite the stresses that occur in typical surface-mount assembly operations.

This report summarizes the reliability data used to substantiate our surface-mount package assembly quality and reliability.

Quality Assurance Control Policy

Quality Assurance of Outgoing Product

Every lot shipped, including commercial product, must conform to exceptionally high standards for outgoing product quality. This is accomplished with inspections, as well as with Quality Assurance electrical and visual lot sampling. Our Quality Assurance testing guarantees an AQL of:

0.1% for electrical conformance to data sheet specifications.

0.1% for visually observable packaging defects.

Quality Control of Measurement and Test Equipment

The accuracy and reliability of our production test equipment directly affects product quality. Maxim's standard procedure for ensuring correct operation and calibration of this equipment includes the following:

- 1) Daily computer-controlled calibration of production testers using standards traceable to the National Institute of Standards and Technology (NIST)
- 2) The establishment of KGUs (known good units), and their daily use for verifying production setup

Maxim is compliant to ANSI/NCSL Z540-1 and all ISO 9000 requirements for calibration control.

**TABLE 1. MAXIM SURFACE-MOUNT
PACKAGE TYPES**

PKG. TYPE	DESCRIPTION	LEAD COUNT	MAX WIDTH	MAX LENGTH	THICKNESS	PITCH
NSO	Narrow Small Outline	8	4.0	5.0	1.50	1.27
		14	4.0	8.75	1.50	1.27
		16	4.0	10.0	1.50	1.27
		28	7.6	18.1	2.35	1.27
WSO	Wide Small Outline	16	7.6	10.50	2.35	1.27
		18	7.6	11.75	2.35	1.27
		20	7.6	13.00	2.35	1.27
		24	7.6	15.6	2.35	1.27
		28	7.6	18.1	2.35	1.27
SSOP	Shrink Small Outline	14	5.38	6.33	1.78	0.65
		16	5.38	6.33	1.78	0.65
		20	5.38	7.33	1.78	0.65
		24	5.38	8.33	1.78	0.65
		28	5.38	10.33	1.78	0.65
		36	7.57	15.49	2.37	0.80
TSSOP	Thin Shrink Small Outline	16	4.50	5.1	0.95	0.65
		20	4.50	6.6	0.95	0.65
		24	4.50	7.9	0.95	0.65
		28	4.50	9.8	0.95	0.65
QSOP	Quarter Small Outline	16	3.99	4.98	1.55	0.635
		20	3.99	8.74	1.55	0.635
		24	3.99	8.74	1.55	0.635
		28	3.99	9.98	1.55	0.635
POFP	Quad Flat Pack	44	10.109	10.109	2.134	0.80
μMAX	Maxim μMAX	8	3.05	3.05	0.91	0.635
		10	3.15	3.099	0.94	0.5
SOT	Small	3	1.397	3.048	1.067	2.032
		4	1.397	3.048	1.067	2.007
		5	1.75	3.0	1.30	0.95
		6	1.75	3.0	1.30	0.95
SC70	SC70	5	1.35	2.20	1.00	0.65
TOFP	Thin Quad Flat Pack	32	7.0	7.0	1.45	0.8
		48	7.0	7.0	1.45	0.5
		64	10.0	10.0	1.45	0.5
MOFP	Metric Quad Flat Pack	44	10.109	10.109	2.134	0.80
		100	14.10	20.10	3.05	0.65
PLCC	Plastic Leaded Chip Carrier	20	9.04	9.04	3.96	1.27
		28	12.57	12.57	3.96	1.27
		44	17.65	17.65	3.96	1.27
		68	25.27	25.27	3.96	1.27

Note: All dimensions are in millimeters

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Maxim Plastic Surface-Mount Package Types

Maxim offers a wide range of plastic surface-mount packages, from the miniature SC70, SOT, μ MAX, NSO, and WSO, to the medium to high pin-count SSOP, TSSOP, QSOP, QFP, TQFP, PLCC, BGA, etc. All these surface-mount packages conform to the JEDEC outline (except the μ MAX, which is a Maxim proprietary package). Please refer to **Table 1** for available Maxim surface-mount packages.

Customers can select a preferred package type from Table 1. Maxim's surface-mount packages can be shipped in antistatic plastic rails. They are also available in tape-and-reel format for customers using automatic placement systems. The tape is wound and shipped on reels. The tape-and-reel specifications can be found in the EIA (Electronic Industries Association) specification 481-A. Due to the IC device application in the intended end market, not all package types are available for each device. Consult your nearest Maxim representative or factory for your package selection and availability.

Surface-Mount Package Reliability

Surface-mount packages offer significant advantages over the standard epoxy plastic DIPs: a smaller footprint and lower profile. However, these physical advantages can cause reliability problems, particularly in high-humidity environments. Achieving surface-mount reliability rivaling that of plastic DIPs (especially in harsh, humid environments) requires a unique combination of molding compound formulation and cure time, material expansion coefficients, leadframe composition and processing, and lead finish.

Effects of Thermal Stress on Surface-Mount Packages

The surface-mounting of SOIC packages subjects them to more stress than does the soldering of through-hole devices. This exposure to high temperature can degrade the package's moisture resistance, due to microcracks created on the molding compound and leadframe interface. In some cases, it can also cause the plastic package to crack (usually at the edge of the die attach pad) from the high-stress-concentration area, and this crack can propagate to the outside of the plastic package. Once a

crack is created, corrosive contaminants from flux and solder paste can enter the package.

Subsequent exposure of the device to a humid environment can cause the contaminants to dissolve and flow along the microcracks to the die. The resulting aluminum corrosion can cause premature device failure.

Another reliability concern for surface-mount packages is stress-induced cracking on the die surface when the package is subjected to thermal cycling stress. This includes passivation cracking, dielectric cracking or, in the worst case, die cracking. All these defects can cause a malfunction of the integrated circuit inside the surface-mount package.

Using state-of-the-art materials and processing, Maxim has developed a packaging system that reduces stress to the die surface. This system reduces or eliminates the occurrence of microcracks, package cracks, and stress-induced die cracks, while providing superior moisture resistance. Maxim is constantly looking for improvements in molding compounds, die attach material, and assembly processing, to achieve even better package reliability performance.

Reliability Methodology

Maxim's surface-mount packages are subjected to the same stringent reliability qualification as DIP products, plus a sequence of stringent solder reflow tests simulating worst-case surface-mount package PC board assembly. **Table 2** lists Maxim's standard reliability tests for our surface-mount packages.

TABLE 2. SURFACE-MOUNT PACKAGE RELIABILITY TESTS

RELIABILITY STRESS TEST	TEST CONDITIONS	SAMPLING PLAN
High-Temperature Operating Life Test (HTOL)	135°C, biased, 1000 hrs	1/77
Biased Temperature and Humidity Test (85/85)	85°C/85% R.H., biased, 1000 hrs	1/77
Pressure Pot Test (PP)	121°C/100% R.H., 15 psig, 168 hrs	0/77
Highly Accelerated Stress Test (HAST)	130°C/85% R.H., biased, 100 hrs	0/45
Temperature Cycling Test (T/C)	-65°C to +150°C, air-to-air, 1000 cycles, 2 cycles/hr	1/77
High-Temperature Storage Life Test (HTSL)	150°C ambient, no bias, 1000 hrs	1/77
Infrared Solder Reflow Test	235 \pm 5°C peak 10s, 120s to 180s above 183°C, 3 cycles	0/150
Solder Shock Test	260°C/10s	0/15
Resistance to Soldering Heat Test	300°C/10s	0/15

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Reliability Data

TABLE 3. RELIABILITY TEST SUMMARY

Table 3 summarizes the reliability results of the following tests: 85/85, Pressure Pot, HAST, Temperature Cycling, and HTSL. It also shows the total number of samples tested, total device hours (or total device cycles), and number of rejects detected during reliability testing.

STRESS TEST	TOTAL UNITS TESTED	TOTAL DEVICE HRS (OR CYCLES)	NUMBER OF REJECTS
85/85	1574	1,574,000	0
Pressure Pot	5432	912,576	0
HAST	1387	138,700	1
Temperature Cycling	4809	4,809,000	0
High Temperature Storage Life	3501	3,501,000	0
Infrared Solder Reflow	18,442	—	0

Surface Mount Packages Reeled in Tape

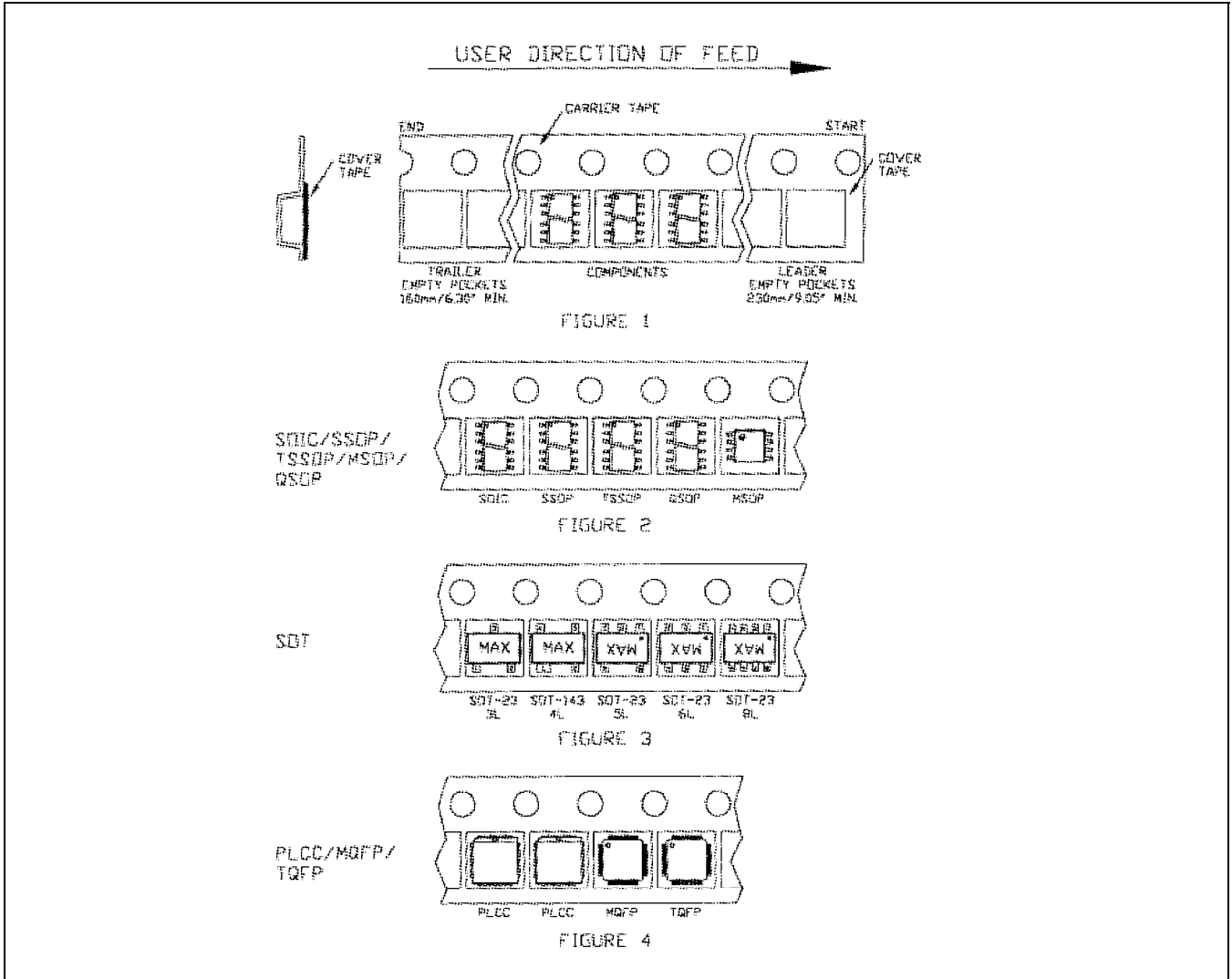
Maxim surface-mount packages are shipped in antistatic plastic rails. For customers using automatic placement systems, parts also come mounted in pockets on embossed tape. The tape is wound and shipped on reels.

The **Table 4** and Figures 1-4 indicate the tape sizes used for various package types and the basic orientation convention used. Further tape-and-reel specifications can be found in the Electronic Industries Association (EIA) standard 481.

TABLE 4. Tape-and-Reel Size/Pitch

DEVICE TYPE	BODY SIZE	PIN COUNT	TAPE WIDTH (mm)	TAPE PITCH (mm)	REEL SIZE (inch)	QUANTITY PER REEL	ORIENTATION IN TAPE
SOIC	.150	8	12	8	13	2500	Figure 2
		14	16	8	13		
		16	16	8	13		
	.300	16	16	12	13	1000	Figure 2
		18	24	16	13		
		20	24	12	13		
24		24	12	13			
QSOP	.150	16	12	8	13	2500	Figure 2
		20	16	8	13		
		24	16	8	13		
		28	16	8	13		
SSOP	.209	14	16	12	13	2000	Figure 2
		16	16	12	13		
		20	16	12	13		
		24	16	12	13		
	.300	28	16	12	13	1000	Figure 2
		36	24	12	13		
TSSOP	.173	16	16	8	13	2500	Figure 2
		20	16	8	13		
		24	16	8	13		
		28	16	8	13		
PLCC		20	16	12	13	1000	Figure 4
		28	24	16	13	500	
		44	32	24	13	250	
		68	44	32	13	250	
MSOP	.118	8	12	8	13	2500	Figure 2
		10	12	8	13		
SOT23-3		3	8	4	7*	2500*	Figure 3
SOT143		4	8	4	7*		
SOT23-5		5	8	4	7*		
SOT23-6		6	8	4	7*		
SOT23-8		8	8	4	7*		
TQFP		7x7	32	16	12		
	7x7	48	16	12	13	750	
	10x10	64	24	16	13		
	12x12	80	24	24	13		
MQFP	10x10	44	24	24	13	750	Figure 4
	14x20	100	44	32	13	400	

*OPTION = 13 at 10,000 parts per reel.



Figures 1-4. Basic Tape and Reel Orientation

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Tables 5–10 list the results of reliability tests Maxim has performed for various surface-mount packages.

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TABLE 5. TEMPERATURE AND HUMIDITY TEST RESULTS (85/85)

DEVICE TYPE	DATE CODE	PACKAGE TYPE	SAMPLE SIZE	FAILURES (HRS)	
				500	1000
SO					
MAX662	9523	8 SO	44	0	0
MAX706	9532	8 SO	76	0	0
MAX8211	9538	8 SO	44	0	0
MAX921	9547	8 SO	39	0	0
MAX478	9548	8 SO	42	0	0
REF01	9550	8 SO	77	0	0
MAX471	9607	8 SO	45	0	0
MAX8211	9612	8 SO	77	0	0
MAX8211	9624	8 SO	76	0	0
MAX8211	9633	8 SO	77	0	0
MAX8211	9636	8 SO	38	0	0
MAX692	9637	8 SO	45	0	0
MAX8211	9650	8 SO	75	0	0
MAX8211	9712	8 SO	77	0	0
MAX8211	9724	8 SO	76	0	0
MAX8211	9735	8 SO	45	0	0
MAX890	9811	8 SO	45	0	0
MAX8211	9815	8 SO	45	0	0
MAX887	9827	8 SO	77	0	0
MAX850	9827	8 SO	77	0	0
MAX8211	9841	8 SO	45	0	0
MAX798	9737	16 NSO	77	0	0
MAX202	9538	16 WSO	26	0	0
MAX202E	9604	16 WSO	26	0	0
MAX213	9530	28 WSO	43	0	0
MAX211	9537	28 WSO	45	0	0
Subtotals			1459	0	0
SSOP					
MAX211E	9542	28 SSOP	45	0	0
MAX211E	9545	28 SSOP	45	0	0
Subtotals			90	0	0
PLCC					
MAX547	9749	44 PLCC	25	0	0
Subtotals			25	0	0
Combined Totals			1574	0	0

**TABLE 6. PRESSURE POT TEST RESULTS
121°C/100% RH/15 PSIG/168 HRS.**

DEVICE TYPE	DATE CODE	PACKAGE TYPE	SAMPLE SIZE	FAILURES (HRS)	NOTES
				168	
SOT					
MAX809	9611	3SOT	43	0	
MAX809	9613	3SOT	45	0	
MAX809	9614	3SOT	44	0	
MAX6809	9727	3SOT	40	0	
MAX811	9701	4SOT	61	0	
MAX8863	9602	5SOT	60	0	
MAX8864	9602	5SOT	53	0	
MAX8864	9612	5SOT	59	0	
MAX8863	9647	5SOT	77	0	
MAX8863	9724	5SOT	40	0	
MAX4180	9741	6SOT	74	0	
Subtotals			596	0	
SO					
MAX660	9528	8SO	45	0	
MAX706	9532	8SO	45	0	
MAX680	9538	8SO	77	0	
MAX8211	9538	8SO	44	0	
MAX619	9546	8SO	45	0	
MAX619	9548	8SO	45	0	
MAX478	9548	8SO	43	0	
REF01	9550	8SO	36	0	
MAX471	9604	8SO	77	0	
MAX850	9607	8SO	77	0	
MAX850	9611	8SO	77	0	
MAX8211	9611	8SO	42	0	
MAX8211	9650	8SO	44	0	
MAX8211	9712	8SO	45	0	
MAX4112	9716	8SO	77	0	
MAX4503	9716	8SO	45	0	
MAX619	9717	8SO	45	0	
MAX8211	9724	8SO	45	0	
MAX667	9725	8SO	45	0	
MAX667	9726	8SO	45	0	
MAX8211	9735	8SO	45	0	
MAX8211	9735	8SO	45	0	
MAX667	9736	8SO	45	0	
MAX890	9736	8SO	45	0	
MAX850	9737	8SO	41	0	
MAX707	9747	8SO	42	0	
MAX619	9748	8SO	45	0	
MAX8211	9749	8SO	45	0	
MAX619	9801	8SO	45	0	
MAX843	9806	8SO	45	0	
MAX890	9811	8SO	45	0	
MAX887	9813	8SO	45	0	
MAX6160	9815	8SO	45	0	
MAX8211	9815	8SO	45	0	
MAX887	9826	8SO	45	0	
MAX850	9827	8SO	45	0	
MAX8211	9841	8SO	45	0	
MAX545	9703	14SO	45	0	
MAX243	9615	16SO	45	0	
MAX243	9621	16SO	44	0	
MAX797	9648	16SO	80	0	
MAX8213	9721	16SO	45	0	
MAX797	9723	16SO	45	0	
DG445	9730	16SO	45	0	
MAX798	9737	16SO	45	0	
MAX849	9745	16SO	77	0	
MAX797	9807	16SO	45	0	
MAX232A	9814	16SO	45	0	
MAX202	9538	16WSO	45	0	
DG303	9601	16WSO	45	0	
MAX232	9602	16WSO	76	0	
MAX232	9729	16WSO	45	0	
MAX232	9730	16WSO	45	0	
MAX232	9746	16WSO	45	0	
MAX232	9748	16WSO	45	0	
MAX384	9724	18SO	41	0	
MAX233A	9718	20WSO	45	0	



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TABLE 6. PRESSURE POT TEST RESULTS
121°C/100% RH/15 PSIG/168 HRS. (continued)

DEVICE TYPE	DATE CODE	PACKAGE TYPE	SAMPLE SIZE	FAILURES (HRS)	NOTES
SOT					
MAX809	9512	3SOT	25	0	
MAX809	9514	3SOT	24	0	
MAX8864	9601	5SOT	24	0	
MAX8864	9602	5SOT	25	0	
MAX8863	9602	5SOT	25	0	
MAX8864	9621	5SOT	25	0	
MAX8863	9622	5SOT	25	0	
MAX4501	9622	5SOT	25	0	
MAX8863	9724	5SOT	25	0	
Subtotals			223	0	
µMAX					
MAX552	9719	10µMAX	25	0	
MAX551	9720	10µMAX	25	0	
MAX4333	9729	10µMAX	24	0	
Subtotals			74	0	
SO					
MAX8211	9538	8SO	25	0	
MAX4123	9618	8SO	25	0	
MAX4125	9620	8SO	25	0	
MAX488	9636	8SO	25	0	
MAX8211	9735	8SO	24	0	
MAX850	9737	8SO	25	0	
MAX8211	9749	8SO	25	0	
MAX843	9806	8SO	25	0	
MAX887	9811	8SO	25	0	
MAX6160	9815	8SO	25	0	
MAX719	9723	16NSO	25	0	
MAX798	9737	16NSO	25	0	
MAX849	9745	16NSO	25	0	
MAX232	9602	16WSO	25	0	
MAX636	9607	16WSO	25	0	
MAX202	9620	16WSO	25	0	
MAX203	9635	20WSO	25	0	
MAX203	9637	20WSO	25	1	Cap Open
MAX203	9640	20WSO	25	0	
MAX233A	9651	20WSO	25	0	
MAX233A	9718	20WSO	25	0	
MAX233A	9719	20WSO	25	0	
MAX203	9725	20WSO	25	0	
Subtotals			574	0	
QSO					
MAX1617	9736	16OSOP	47	0	
MAX768	9741	16OSOP	25	0	
MAX1617	9742	16OSOP	52	0	
MAX768	9743	16OSOP	25	0	
MAX1617	9743	16OSOP	25	0	
Subtotals			174	0	
SSOP					
MAX786	9617	28SSOP	25	0	
MAX211E	9627	28SSOP	25	0	
MAX211	9635	28SSOP	25	0	
MAX1603	9717	28SSOP	25	0	
MAX1630	9717	28SSOP	25	0	
MAX1603	9727	28SSOP	25	0	
Subtotals			150	0	
TSSOP					
MAX1664	9821	20TSSOP	23	0	
MAX1664	9824	20TSSOP	25	0	
Subtotals			48	0	
PLCC					
MAX547	9736	44PLCC	25	0	
MAX547	9737	44PLCC	25	0	
MAX547	9739	44PLCC	25	0	
MAX547	9742	44PLCC	25	0	
Subtotals			100	0	
PQFP					
MAX134	9537	44PQFP	22	0	
MAX134	9538	44PQFP	22	0	
Subtotals			44	0	
Combined Totals			5432	0	

TABLE 7. HAST TEST RESULTS
130°C/85% RH/BIASED/100 HRS.

DEVICE TYPE	DATE CODE	PACKAGE TYPE	SAMPLE SIZE	FAILURES (HRS)	NOTES
SOT					
MAX809	9512	3SOT	25	0	
MAX809	9514	3SOT	24	0	
MAX8864	9601	5SOT	24	0	
MAX8864	9602	5SOT	25	0	
MAX8863	9602	5SOT	25	0	
MAX8864	9621	5SOT	25	0	
MAX8863	9622	5SOT	25	0	
MAX4501	9622	5SOT	25	0	
MAX8863	9724	5SOT	25	0	
Subtotals			223	0	
µMAX					
MAX552	9719	10µMAX	25	0	
MAX551	9720	10µMAX	25	0	
MAX4333	9729	10µMAX	24	0	
Subtotals			74	0	
SO					
MAX8211	9538	8SO	25	0	
MAX4123	9618	8SO	25	0	
MAX4125	9620	8SO	25	0	
MAX488	9636	8SO	25	0	
MAX8211	9735	8SO	24	0	
MAX850	9737	8SO	25	0	
MAX8211	9749	8SO	25	0	
MAX843	9806	8SO	25	0	
MAX887	9811	8SO	25	0	
MAX6160	9815	8SO	25	0	
MAX719	9723	16NSO	25	0	
MAX798	9737	16NSO	25	0	
MAX849	9745	16NSO	25	0	
MAX232	9602	16WSO	25	0	
MAX636	9607	16WSO	25	0	
MAX202	9620	16WSO	25	0	
MAX203	9635	20WSO	25	0	
MAX203	9637	20WSO	25	1	Cap Open
MAX203	9640	20WSO	25	0	
MAX233A	9651	20WSO	25	0	
MAX233A	9718	20WSO	25	0	
MAX233A	9719	20WSO	25	0	
MAX203	9725	20WSO	25	0	
Subtotals			574	0	
QSO					
MAX1617	9736	16OSOP	47	0	
MAX768	9741	16OSOP	25	0	
MAX1617	9742	16OSOP	52	0	
MAX768	9743	16OSOP	25	0	
MAX1617	9743	16OSOP	25	0	
Subtotals			174	0	
SSOP					
MAX786	9617	28SSOP	25	0	
MAX211E	9627	28SSOP	25	0	
MAX211	9635	28SSOP	25	0	
MAX1603	9717	28SSOP	25	0	
MAX1630	9717	28SSOP	25	0	
MAX1603	9727	28SSOP	25	0	
Subtotals			150	0	
TSSOP					
MAX1664	9821	20TSSOP	23	0	
MAX1664	9824	20TSSOP	25	0	
Subtotals			48	0	
PLCC					
MAX547	9736	44PLCC	25	0	
MAX547	9737	44PLCC	25	0	
MAX547	9739	44PLCC	25	0	
MAX547	9742	44PLCC	25	0	
Subtotals			100	0	
PQFP					
MAX134	9537	44PQFP	22	0	
MAX134	9538	44PQFP	22	0	
Subtotals			44	0	
Combined Totals			1387	1	

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TABLE 8. TEMPERATURE CYCLING TEST RESULTS
-65°C TO +150°C/1000 CYCLES

DEVICE TYPE	DATE CODE	PKG. TYPE	SAMPLE SIZE	FAILURES (CYCLES)			NOTES
				200	500	1000	
SOT							
MAX809	9611	3SOT	44	0	0	0	
MAX809	9614	3SOT	44	0	0	0	
MAX811	9701	4SOT	75	0	0	0	
MAX8864	9601	5SOT	47	0	0	0	
MAX8864	9602	5SOT	44	0	0	0	
MAX8863	9602	5SOT	60	0	0	0	
MAX8864	9621	5SOT	72	0	0	0	
MAX8863	9622	5SOT	77	0	0	0	
MAX4501	9622	5SOT	67	0	0	0	
MAX8863	9725	5SOT	45	0	0	0	
Subtotals			575	0	0	0	
μMAX							
MAX552	9719	10μMAX	77	0	0	0	
MAX551	9720	10μMAX	77	0	0	0	
MAX4333	9729	10μMAX	77	0	0	0	
Subtotals			231	0	0	0	
SO							
MAX662	9523	8SO	33	0	0	0	
MAX660	9528	8SO	45	0	0	0	
MAX706	9532	8SO	77	0	0	0	
MAX680	9538	8SO	44	0	0	0	
MAX8211	9538	8SO	44	0	0	0	
MAX619	9546	8SO	74	0	0	0	
MAX619	9548	8SO	75	0	0	0	
MAX478	9548	8SO	45	0	0	0	
REF01	9550	8SO	77	0	0	0	
MAX471	9607	8SO	45	0	0	0	
MAX8211	9624	8SO	77	0	0	0	
MAX8212	9633	8SO	77	0	0	0	
MAX488	9636	8SO	45	0	0	0	
MAX692A	9637	8SO	45	0	0	0	
MAX8211	9650	8SO	77	0	0	0	
MAX8211	9712	8SO	77	0	0	0	
MAX4112	9716	8SO	77	0	0	0	
MAX8211	9724	8SO	77	0	0	0	
MAX667	9725	8SO	71	0	0	0	
MAX667	9726	8SO	77	0	0	0	
MAX8211	9735	8SO	45	0	0	0	
MAX8211	9735	8SO	77	0	0	0	
MAX667	9736	8SO	45	0	0	0	
MAX890	9736	8SO	45	0	0	0	
MAX850	9737	8SO	45	0	0	0	
MAX8211	9749	8SO	77	0	0	0	
MAX843	9806	8SO	45	0	0	0	
MAX890	9811	8SO	45	0	0	0	
MAX887	9813	8SO	77	0	0	0	
MAX8211	9815	8SO	77	0	0	0	

DEVICE TYPE	DATE CODE	PKG. TYPE	SAMPLE SIZE	FAILURES (CYCLES)			NOTES
				200	500	1000	
MAX887	9827	8SO	77	0	0	0	
MAX850	9827	8SO	77	0	0	0	
MAX8211	9841	8SO	77	0	0	0	
MAX545	9703	14NSO	77	0	0	0	
MAX719	9724	16NSO	45	0	0	0	
MX7533	9726	16NSO	45	0	0	0	
MAX798	9737	16NSO	45	0	0	0	
MAX798	9737	16NSO	77	0	0	0	
MAX849	9745	16NSO	77	0	0	0	
MAX797	9807	16NSO	77	0	0	0	
MXA691A	9836	16NSO	77	0	0	0	
MAX202E	9604	16WSO	44	0	0	0	
MAX202	9538	16WSO	45	0	0	0	
DG303	9601	16WSO	77	0	0	0	
MAX232	9602	16WSO	77	0	0	0	
MAX676	9533	20WSO	53	0	0	0	
MAX213	9530	28WSO	45	0	0	0	
MAX211	9537	28WSO	45	0	0	0	
Subtotals			2974	0	0	0	
QSOP							
MAX846	9640	16QSOP	77	0	0	0	
MAX768	9734	16QSOP	45	0	0	0	
MAX768	9746	16QSOP	45	0	0	0	
Subtotals			167	0	0	0	
SSOP							
MAX767	9527	20SSOP	44	0	0	0	
MAX211	9530	28SSOP	45	0	0	0	
MAX211E	9542	28SSOP	44	0	0	0	
MAX241E	9544	28SSOP	45	0	0	0	
MAX211E	9545	28SSOP	45	0	0	0	
MAX211E	9546	28SSOP	45	0	0	0	
MAX1630	9627	28SSOP	45	0	0	0	
MAX211	9635	28SSOP	76	0	0	0	
MAX1603	9727	28SSOP	45	0	0	0	
Subtotals			478	0	0	0	
TSSOP							
MAX1664	9821	20TSSOP	77	0	0	0	
MAX1614	9824	20TSSOP	77	0	0	0	
Subtotals			154	0	0	0	
PLCC							
MAX547	8737	44PLCC	45	0	0	0	
MAX547	9736	44PLCC	45	0	0	0	
MAX547	9739	44PLCC	45	0	0	0	
MAX547	9742	44PLCC	45	0	0	0	
MAX547	9746	44PLCC	25	0	0	0	
MAX547	9749	44PLCC	25	0	0	0	
Subtotals			230	0	0	0	
Combined Totals			4809	0	0	0	



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**TABLE 9. HIGH TEMPERATURE STORAGE TEST RESULTS
150°C/1000 HRS.**

DEVICE TYPE	DATE CODE	PACKAGE TYPE	SAMPLE SIZE	FAILURES (HRS)			NOTES
				168	500	1000	
SO							
MAX8864	9601	5SOT	45	0	0	0	
MAX8864	9602	5SOT	44	0	0	0	
MAX8863	9602	5SOT	42	0	0	0	
MAX8864	9621	5SOT	73	0	0	0	
MAX8863	9622	5SOT	42	0	0	0	
MAX8863	9724	5SOT	40	0	0	0	
Subtotals			286	0	0	0	
μMAX							
MAX552	9719	10μMAX	45	0	0	0	
MAX551	9720	10μMAX	44	0	0	0	
MAX4333	9729	10μMAX	45	0	0	0	
Subtotals			134	0	0	0	
SO							
MAX660	9528	8SO	45	0	0	0	
MAX706	9532	8SO	45	0	0	0	
MAX8211	9538	8SO	44	0	0	0	
MAX680	9538	8SO	45	0	0	0	
MAX619	9548	8SO	77	0	0	0	
MAX478	9548	8SO	43	0	0	0	
REF01	9550	8SO	45	0	0	0	
MAX8211	9612	8SO	45	0	0	0	
MAX8211	9624	8SO	45	0	0	0	
MAX8212	9633	8SO	45	0	0	0	
MAX8211	9650	8SO	45	0	0	0	
MAX471	9707	8SO	45	0	0	0	
MAX8211	9712	8SO	45	0	0	0	
MAX4112	9716	8SO	45	0	0	0	
MAX8211	9724	8SO	45	0	0	0	
MAX8211	9735	8SO	45	0	0	0	
MAX8211	9735	8SO	45	0	0	0	
MAX667	9736	8SO	45	0	0	0	
MAX850	9737	8SO	45	0	0	0	
MAX8211	9749	8SO	77	0	0	0	
MAX843	9806	8SO	45	0	0	0	
MAX890	9811	8SO	45	0	0	0	
MAX887	9813	8SO	45	0	0	0	
MAX6160	9815	8SO	45	0	0	0	
MAX8211	9815	8SO	45	0	0	0	
MAX887	9827	8SO	45	0	0	0	
MAX850	9827	8SO	45	0	0	0	
MAX8211	9841	8SO	77	0	0	0	
MAX798	9737	16NSO	44	0	0	0	
MAX798	9737	16NSO	45	0	0	0	
MAX849	9745	16NSO	45	0	0	0	
MAX202	9538	16WSO	45	0	0	0	
DG303	9601	16WSO	45	0	0	0	

DEVICE TYPE	DATE CODE	PACKAGE TYPE	SAMPLE SIZE	FAILURES (HRS)			NOTES
				168	500	1000	
QSOP							
MAX202E	9604	16WSO	45	0	0	0	
MAX233A	9617	20WSO	14	0	0	0	
MAX233A	9618	20WSO	14	0	0	0	
MAX203	9635	20WSO	45	0	0	0	
MAX203	9637	20WSO	45	0	0	0	
MAX203	9640	20WSO	45	0	0	0	
MAX203	9725	20WSO	45	0	0	0	
MAX213	9530	28WSO	45	0	0	0	
MAX211	9537	28WSO	44	0	0	0	
Subtotals			1919	0	0	0	
QSOP							
MAX768	9734	16QSOP	43	0	0	0	
MAX768	9741	16QSOP	45	0	0	0	
MAX1617	9742	16QSOP	100	0	0	0	
MAX768	9743	16QSOP	45	0	0	0	
MAX1617	9743	16QSOP	100	0	0	0	
MAX1617	9744	16QSOP	100	0	0	0	
MAX768	9750	16QSOP	45	0	0	0	
Subtotals			478	0	0	0	
SSOP							
MAX211	9530	28SSOP	45	0	0	0	
MAX211E	9542	28SSOP	44	0	0	0	
MAX241E	9544	28SSOP	45	0	0	0	
MAX211E	9545	28SSOP	45	0	0	0	
MAX211E	9546	28SSOP	45	0	0	0	
MAX211	9635	28SSOP	45	0	0	0	
MAX211	9644	28SSOP	45	0	0	0	
MAX1603	9717	28SSOP	45	0	0	0	
MA1603	9727	28SSOP	45	0	0	0	
MAX1632	9744	28SSOP	45	0	0	0	
Subtotals			449	0	0	0	
TSSOP							
MAX1664	9821	20TSSOP	45	0	0	0	
MAX1664	9824	20TSSOP	45	0	0	0	
Subtotals			90	0	0	0	
PLCC							
MAX547	9736	44PLCC	45	0	0	0	
MAX547	9737	44PLCC	10	0	0	0	
MAX547	9739	44PLCC	45	0	0	0	
MAX547	9742	44PLCC	45	0	0	0	
Subtotals			145	0	0	0	
Combined Totals			3501	0	0	0	

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TABLE 10. INFRARED SOLDER REFLOW TEST

DEVICE TYPE	DATE CODE	PACKAGE TYPE	SAMPLE SIZE	FAILURES
		SOT		
MAX809LEUR	9626	3 SOT23	147	0
MAX809LEUR	9628	3 SOT23	154	0
MAX811MEUS	9701	4 SOT23	200	0
MAX4501CUK	9846A	5 SC70	150	0
MAX4501CUK	9846B	5 SC70	150	0
MAX4501CUK	9846C	5 SC70	150	0
MAX8864SEUK	9601	5 SOT23	143	0
MAX8863TEUK	9602	5 SOT23	158	0
MAX8864TEUK	9602	5 SOT23	149	0
MAX8864SEUK	9621	5 SOT23	200	0
MAX8863TEUK	9622	5 SOT23	200	0
MAX4501CUK	9622	5 SOT23	200	0
MAX828EUK	9750	5 SOT23	147	0
MAX828EUK	9802	5 SOT23	150	0
MAX828EUK	9803	5 SOT23	150	0
MAX4501CUK	9803	5 SOT23	150	0
MAX4501CUK	9807	5 SOT23	150	0
MAX4501CUK	9808	5 SOT23	150	0
MAX4501CUK	9808	5 SOT23	150	0
MAX4180EUT	9741	6 SOT23	150	0
MAX4180EUT	9742	6 SOT23	150	0
MAX4529EUK	9802	6 SOT23	150	0
MAX4330EUK	9844A	6 SOT23	150	0
MAX4330EUK	9844B	6 SOT23	150	0
MAX4501CUK	9847A	8 SOT23	150	0
MAX4501CUK	9847B	8 SOT23	150	0
MAX4501CUK	9847C	8 SOT23	150	0
Subtotals			4248	0
		µMAX		
MAX708CUA	9750	8 µMAX	150	0
MAX708CUA	9751	8 µMAX	150	0
MAX708CUA	9801	8 µMAX	150	0
MAX708CUA	9801	8 µMAX	150	0
MAX860IUA	9820	8 µMAX	150	0
MAX708CUA	9841A	8 µMAX	150	0
MAX708CUA	9841B	8 µMAX	150	0
MAX708CUA	9841C	8 µMAX	150	0
MAX662BCUB	9719	10 µMAX	177	0
MAX551BCUB	9720	10 µMAX	180	0
MAX4333EUB	9729	10 µMAX	180	0
Subtotals			1737	0
		SO		
MAX667CSA	9725	8 SO	179	0
MAX667CSA	9726	8 SO	180	0
MAX667CSA	9734	8 SO	180	0
MAX8211CSA	9735	8 SO	180	0
MAX667CSA	9736	8 SO	180	0
MAX707CSA	9747	8 SO	150	0
MAX707CSA	9747	8 SO	42	0
MAX707CSA	9748	8 SO	43	0
MAX619ESA	9748	8 SO	45	0
MAX619ESA	9749	8 SO	45	0
MAX663ESA	9809	8 SO	150	0
MAX843ISA	9810	8 SO	150	0
MAX485CSA	9810	8 SO	150	0
MAX485CSA	9810	8 SO	150	0
MAX843ISA	9811	8 SO	150	0
MAX843ISA	9812	8 SO	150	0
MAX663ESA	9820	8 SO	150	0
MAX663ESA	9820	8 SO	150	0
MAX485CSA	9821	8 SO	150	0
MAX663ESA	9836	8 SO	150	0
MAX485CSA	9837	8 SO	150	0
MAX4331ESA	9844A	8 SO	150	0
MAX4331ESA	9844B	8 SO	150	0
MAX418ESD	9732	14 NSO	150	0
MAX479CSD	9740	14 NSO	150	0
MAX414CSD	9746	14 NSO	150	0
MAX475CSD	9810	14 NSO	150	0
MAX719CSE	9723	16 NSO	180	0
MAX719CSE	9724	16 NSO	140	0
MAX691ACSE	9810	16 NSO	150	0
MAX691ACSE	9828	16 NSO	150	0
MAX691ACSE	9836	16 NSO	150	0
MAX232CWE	9746	16 WSO	45	0
MAX232CWE	9748	16 WSO	45	0
MAX203EWP	9635	20 WSO	140	0
MAX203CWP	9637	20 WSO	140	0
MAX203CWP	9640	20 WSO	140	0

DEVICE TYPE	DATE CODE	PACKAGE TYPE	SAMPLE SIZE	FAILURES
MAX233ACWP	9649	20 WSO	105	0
MAX233ACWP	9650	20 WSO	105	0
MAX233ACWP	9651	20 WSO	105	0
MAX233ACWP	9718	20 WSO	150	0
MAX233ACWP	9719	20 WSO	150	0
MAX203CWP	9725	20 WSO	160	0
MAX233ACWP	9804	20 WSO	50	0
MAX233ACWP	9806	20 WSO	50	0
Subtotals			5929	0
		QSOP		
MAX869LEEE	9730	16 QSOP	149	0
MAX768EEE	9734	16 QSOP	150	0
MAX768EEE	9734	16 QSOP	180	0
MAX768EEE	9746	16 QSOP	180	0
MAX869LEEE	9747	16 QSOP	150	0
MAX1617MEE	9803	16 QSOP	230	0
MAX1617MEE	9816	16 QSOP	150	0
MAX1617MEE	9819	16 QSOP	150	0
MAX1617MEE	9820	16 QSOP	150	0
MAX1617MEE	9821	16 QSOP	150	0
MAX1617MEE	9834	16 QSOP	100	0
MAX1617MEE	9837	16 QSOP	100	0
MAX1617MEE	9838	16 QSOP	100	0
MAX1617MEE	9839	16 QSOP	100	0
MAX1617MEE	9840	16 QSOP	100	0
MAX1617MEE	9841	16 QSOP	100	0
Subtotals			2239	0
		SSOP		
MAX211CAI	9635	28 SSOP	200	0
MAX211CAI	9644	28 SSOP	190	0
MAX213CAI	9709	28 SSOP	99	0
MAX211ECAI	9725	28 SSOP	500	0
MAX211CAI	9733	28 SSOP	500	0
MAX241CAI	9849A	28 SSOP	150	0
MAX241CAI	9849B	28 SSOP	150	0
MAX241CAI	9849C	28 SSOP	150	0
Subtotals			1939	0
		TSSOP		
MAX1664CUP	9810	20 TSSOP	150	0
MAX1664CUP	9813	20 TSSOP	100	0
MAX1664CUP	9821	20 TSSOP	150	0
MAX1664CUP	9824	20 TSSOP	150	0
MAX3243EUT	9841A	28 TSSOP	100	0
MAX3243EUT	9841B	28 TSSOP	100	0
MAX3243EUT	9841C	28 TSSOP	100	0
MAX3243EUI	9851A	28 TSSOP	150	0
MAX3243EUI	9851B	28 TSSOP	150	0
MAX3243EUI	9851C	28 TSSOP	150	0
MAX3243EUI	9851A	28 TSSOP-EP	150	0
MAX3243EUI	9851B	28 TSSOP-EP	150	0
MAX3243EUI	9851C	28 TSSOP-EP	150	0
Subtotals			1750	0
		PLCC		
MAX547ACQH	9737	44 PLCC	150	0
MAX547ACQH	9742	44 PLCC	150	0
Subtotals			300	0
		PQFP		
MAX136CMH	9817	44 PQFP	150	0
MAX136CMH	9820	44 PQFP	150	0
Subtotals			300	0
Combined Totals			18842	0