RELIABILITY REPORT

FOR

MAX2235EUP+

PLASTIC ENCAPSULATED DEVICES

December 17, 2008

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
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Quality Assurance
Director, Reliability Engineering

Conclusion

The MAX2235EUP+ successfully meets the quality and reliability standards required of all Maxim products. In addition, Maxim"s continuous reliability monitoring program ensures that all outgoing product will continue to meet Maxim"s quality and reliability standards.

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I. Device Description

A. General

The MAX2235 low-voltage, silicon RF power amplifier (PA) is designed for use in the 900MHz frequency band. It operates directly from a single +2.7V to +5.5V supply, making it suitable for use with 3-cell NiCd or 1-cell Li-Ion batteries. The device delivers +30dBm (1W) typical output power from a +3.6V supply or +28dBm from a +2.7V supply. The MAX2235's gain is adjustable over a 37dB range. A power-control pin controls gain and bias to maintain optimum efficiency, even at lower output power levels, thus extending the operating life of the battery. At +30dBm output power, efficiency is typically 47%. An additional power-saving feature is a shutdown mode that typically reduces supply current below 1µA. A key feature of this PA is its autoramping capability. During turn-on and turn-off periods, the RF envelope is controlled to approximate a raised cosine on the rising and falling edge, thereby minimizing transient noise and spectral splatter. The ramp time is set by selecting the value of an external capacitor. The MAX2235 is intended for use in constant envelope applications such as AMPS, two-way paging, or FSK-based communications in the 900MHz ISM band. The device is available in a thermally enhanced 20-pin TSSOP package with a heat slug.

II. Manufacturing Information

A. Description/Function:	+3.6V, 1W Autoramping Power Amplifier for 900MHz Applications
B. Process:	GST2
C. Number of Device Transistors:	
D. Fabrication Location:	Oregon
E. Assembly Location:	ATP Philippines, UTL Thailand
F. Date of Initial Production:	April 23, 1999

III. Packaging Information

A. Package Type:	20-pin TSSOP
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive Epoxy
E. Bondwire:	Gold (1.2 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-1821
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1
J. Single Layer Theta Ja:	46°C/W
K. Single Layer Theta Jc:	2°C/W
L. Multi Layer Theta Ja:	37.7°C/W
M. Multi Layer Theta Jc:	2°C/W

IV. Die Information

A. Dimensions:	64 X 79 mils
B. Passivation:	Si_3N_4 (Silicon nitride)
C. Interconnect:	Poly / Au
D. Backside Metallization:	None
E. Minimum Metal Width:	2 microns (as drawn)
F. Minimum Metal Spacing:	2 microns (as drawn)
G. Bondpad Dimensions:	5 mil. Sq.
H. Isolation Dielectric:	SiO_2
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

A. Quality Assurance Contacts:	Ken Wendel (Director, Reliability Engineering) Bryan Preeshl (Managing Director of QA)
B. Outgoing Inspection Level:	0.1% for all electrical parameters guaranteed by the Datasheet. 0.1% For all Visual Defects.
C. Observed Outgoing Defect Rate:	< 50 ppm
D. Sampling Plan:	Mil-Std-105D

VI. Reliability Evaluation

A. Accelerated Life Test

The results of the 150°C biased (static) life test are pending. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 47 \times 2}$$ (Chi square value for MTTF upper limit)

(where 4340 = Temperature Acceleration factor assuming an activation energy of 0.8eV)

$\lambda = 10.2 \times 10^{-9}$

$\lambda = 10.2$ F.I.T. (60% confidence level @ 25°C)

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly 1000 hour life test monitors on its processes. This data is published in the Product Reliability Report found at http://www.maxim-ic.com/. Current monitor data for the GST20 Process results in a FIT Rate of 1.0 @ 25C and 17.8 @ 55C (0.8 eV, 60% UCL)

B. Moisture Resistance Tests

The industry standard 85°C/85%RH or HAST testing is monitored per device process once a quarter.

C. E.S.D. and Latch-Up Testing

The WR28 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1000 V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-200 mA.

Table 1
Reliability Evaluation Test Results

MAX2235EUP+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)				
	Ta = 150°C Biased Time = 192 hrs.	DC Parameters & functionality	47	0
Moisture Testing (Note 2)				
85/85	Ta = 85°C RH = 85% Biased Time = 1000hrs.	DC Parameters & functionality	77	0
Mechanical Stress (Note 2)				
Temperature Cycle	-65°C/150°C 1000 Cycles Method 1010	DC Parameters & functionality	77	0

Note 1: Life Test Data may represent plastic DIP qualification lots.
Note 2: Generic Package/Process data