RELIABILITY REPORT

FOR

MAX2009ETI+T

PLASTIC ENCAPSULATED DEVICES

May 20, 2011

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
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Quality Assurance
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Conclusion

The MAX2009ETI+T 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.

Table of Contents

I. Device Description

A. General

The MAX2009 adjustable RF predistorter is designed to improve power amplifier (PA) adjacent-channel power rejection (ACPR) by introducing gain and phase expansion in a PA chain to compensate for the PA's gain and phase compression. With its +23dBm maximum input power level and wide adjustable range, the MAX2009 can provide up to 12dB of ACPR improvement for power amplifiers operating in the 1200MHz to 2500MHz frequency band. Lower frequencies of operation can be achieved with this IC's counterpart, the MAX2010. The MAX2009 is unique in that it provides up to 7dB of gain expansion and 24° of phase expansion as the input power is increased. The amount of expansion is configurable through two independent sets of control: one set adjusts the gain expansion breakpoint and slope, while the second set controls the same parameters for phase. With these settings in place, the linearization circuit can be run in either a static set-and-forget mode, or a more sophisticated closed-loop implementation can be employed with real-time software-controlled distortion correction. Hybrid correction modes are also possible using simple lookup tables to compensate for factors such as PA temperature drift or PA loading. The MAX2009 comes in a 28-pin thin QFN exposed pad (EP) package (5mm x 5mm) and is specified for the extended (-40°C to +85°C) temperature range.

II. Manufacturing Information

A. Description/Function:	1200MHz to 2500MHz Adjustable RF Predistorter
B. Process:	G4
C. Number of Device Transistors:	
D. Fabrication Location:	Oregon
E. Assembly Location:	China, Malaysia, Taiwan and Thailand
F. Date of Initial Production:	July 25, 2003

III. Packaging Information

A. Package Type:	28-pin TQFN 5x5
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Au (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-0480
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:	47°C/W
K. Single Layer Theta Jc:	2°C/W
L. Multi Layer Theta Ja:	29°C/W
M. Multi Layer Theta Jc:	2°C/W

IV. Die Information

A. Dimensions:	89 X 90 mils
B. Passivation:	Si_3N_4
C. Interconnect:	Au
D. Backside Metallization:	None
E. Minimum Metal Width:	1.2 microns (as drawn) Metal 1, 2 & 3 5.6 microns (as drawn) Metal 4
F. Minimum Metal Spacing:	1.6 microns (as drawn) Metal 1, 2 & 3, 4.2 microns (as drawn) Metal 4
G. Bondpad Dimensions:	
H. Isolation Dielectric:	SiO_2
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

A. Quality Assurance Contacts:	Richard Aburano (Manager, Reliability Engineering) Don Lipps (Manager, Reliability Engineering) Bryan Preeshl (Vice President 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 shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 45 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 24.4 \times 10^{-9}$

$\lambda = 24.4$ F.I.T. (60% confidence level @ 25°C)

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at http://www.maxim-ic.com/qa/reliability/monitor. Cumulative monitor data for the G4 Process results in a FIT Rate of 0.02 @ 25C and 0.37 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot NFM1AQ003C, D/C 0327)

The CR20-1 die type has been found to have all pins able to withstand a HBM transient pulse of 400V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of 250mA.

Table 1
Reliability Evaluation Test Results

MAX2009ETI+T

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 150°C Biased Time = 192 hrs.	DC Parameters & functionality	45	0	NFM1AQ003C, D/C 0327

Note 1: Life Test Data may represent plastic DIP qualification lots.